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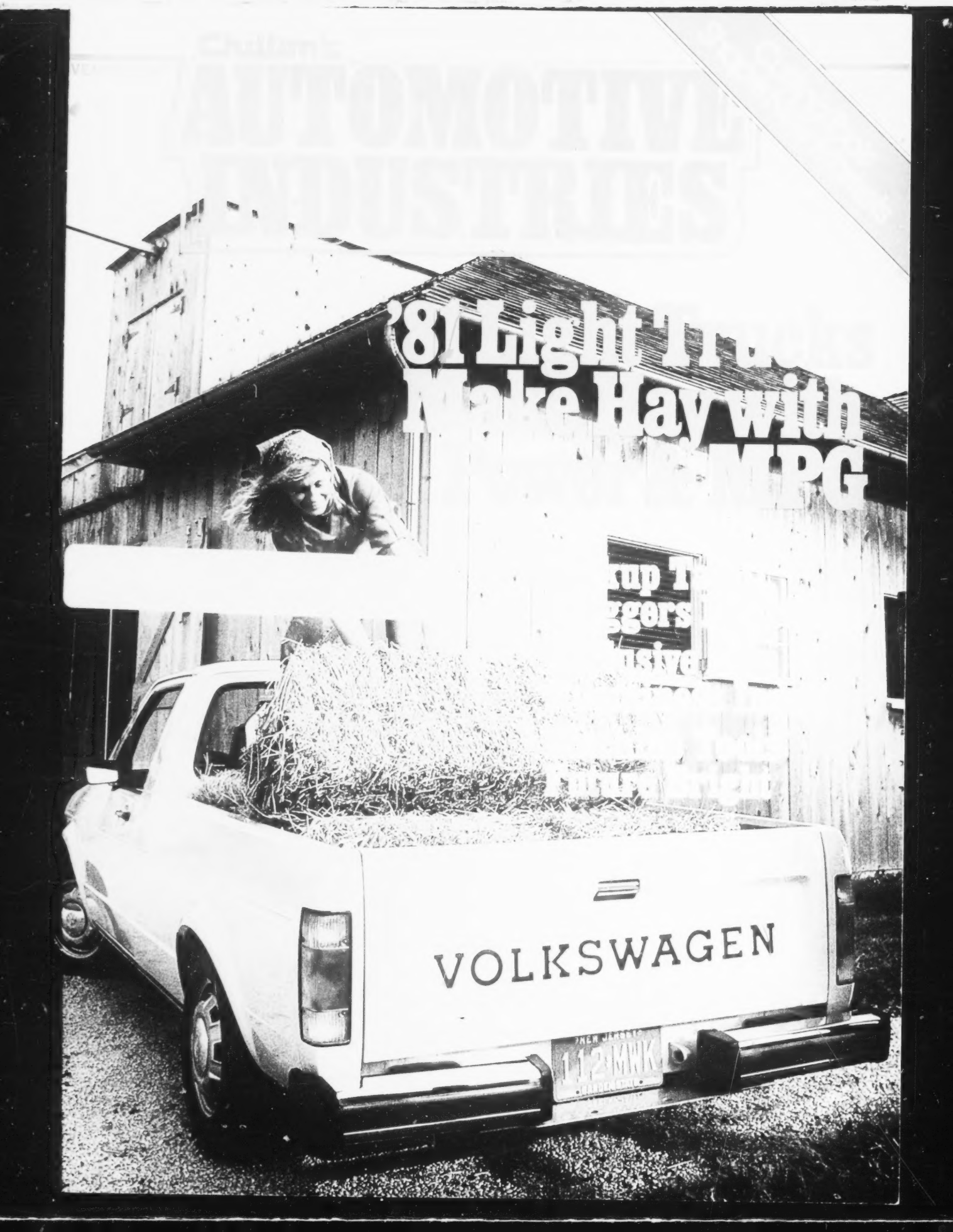
'81 Light
Make Hay with
PG
VOLKSWAGEN

Chilton's AUTOMOTIVE INDUSTRIES

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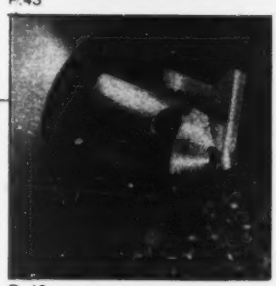
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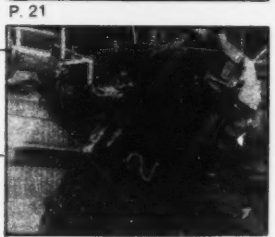
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COVER

Featured this month is Volkswagen's new pickup, a fuel-efficient mini, pictured out yonder in the countryside of Pennsylvania.

NEXT MONTH

December *AI* examines automotive materials—plastics and rubbers, dual-phase and Swedish steel, upholstery and electronics. Plus it peeks at the new imports.

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AUTOMOTIVE INDUSTRIES (ISSN 0005-1527) magazine is published monthly by Chilton Co., Chilton Way, Radnor, PA 19089. Chilton Co. is a division of American Broadcasting Companies Inc., New York, NY. Subscription prices: United States and U.S. Possessions, $20.00 per year. $35.00 for 2 years; Canada $45.00; Other countries $55.00 per year. Air rates on request. Single copies and back issues on request. All subscription orders must be accompanied with cash or check, along with complete information for classification, including the title of the individual and the product the company manufactures. Controlled circulation postage paid at Philadelphia, PA 19104 and Salisbury, MD 21801. POSTMASTER: Send address changes to AUTOMOTIVE INDUSTRIES, P.O. Box 2055, Radnor, PA 19089.

Key Indicators

U.S. New Car Production — Units	Sept. '80	Sept. '79	Year to Date 1980	Year to Date 1979
AMC	12,453	16,418	105,104	118,947
Chrysler	52,918	72,024	441,285	699,682
Ford	122,196	147,632	926,419	1,642,855
GMC	337,746	356,768	3,033,699	3,883,354
Volkswagen of America	2,875	17,230	145,616	121,049
TOTAL	**528,188**	**612,065**	**4,652,073**	**6,465,887**
Imported Car Sales	185,500	172,325	1,868,200	1,821,485
Imported Car Penetration	27.6%	22.2%	27.4%	22.0%

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '79	Year to Date '80
New Orders	Aug	$ 72.9	$ 74.0	$620.0	$591.7
Shipments	Aug	72.8	72.3	589.1	586.2
Inventories	Aug	161.4	160.9	144.9	—
Unfilled Orders	Aug	272.2	272.1	258.3	—
Manufacturers Value of Shipments*					
Primary Metals, Total	Aug	$10.7	$10.2	$94.2	$92.1
Steel	Aug	4.6	4.3	46.8	42.1
Nonferrous Metal	Aug	5.1	5.0	38.5	41.6
Nonelectrical Machinery Equip. Industries, Total	Aug	14.1	13.9	103.6	111.2
Engines & Turbines	June	1.0	1.2	8.8	8.9
Farm Machinery & Equip.	Aug	1.0	1.0	8.9	8.7
Construction, Mining & Materials Handling Equip.	Aug	2.5	2.5	21.3	21.5
Metalworking Machinery	Aug	.8	.8	6.1	7.0
General Industrial Machinery	Aug	1.1	1.1	8.6	9.4
Transportation Equipment Industry, Total	Aug	14.3	14.7	132.6	114.1
Motor Vehicle & Parts	Aug	8.5	8.6	90.0	66.9
Aircraft, Missiles & Parts	Aug	3.9	4.2	28.7	32.2
Shipbuilding & Military Tank Vehicles	Aug	.9	.8	5.4	6.5
Fluid Power Eqpt. (Index 1972 = 100)	Aug	171	194	281	—
Machine Tools**					
Net new orders	Aug	.2	.3	3.3	3.6
Shipments	Aug	.3	.3	3.0	2.4

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).

**Cutting and forming, domestic and foreign.

Sources: U.S. Dept. of Commerce, Individual Motor Vehicle Mfgrs., National Fluid Power Assn., NMTBA.

been coupled to Subaru's on-demand 4wd system in GL models for '81 to offer 46% more low-speed power. A 1.462:1 reduction gear is placed in the drivetrain before the differential.

GL models are equipped with a hill holder which allows stopping on an incline without drifting. Once stopped, the motorist depresses the clutch and applies the brakes. As long as the clutch is depressed, the driver can release the brake and the car won't roll back. To proceed, the driver shifts into first and engages the clutch as usual.

Joining the GLF, GL wagon and GL four-door models is a new GL hatch with cloth and vinyl seats, full instrumentation, intermittent windshield wipers and AM/FM radio.

Honda made few changes for 1981. The Prelude has a new instrument panel. Variable-assist power steering is offered as part of an option package with Honda's own three-speed automatic transmission.

The three-speed automatic is now available on the Civic 1300DX and 1500DX hatchbacks and the wagon. Every model except the 1300 hatch comes with standard steel-belted radials. And all Hondas are available in all 50 states.—*Jennifer M. George*

Cadillac Faces Import Challenge

Surprisingly, imports are now Cadillac's major competition. At a recent news conference, L. B. Pryor, Cadillac general sales manager, announced that imported luxury cars took 21.7% of the luxury "high group" in August, while Cadillac took 33.2%. No Japanese cars are in this group.

Traditionally Lincoln has been Cadillac's major competitor, but recently Lincoln's share of market has bottomed out at 7%, according to Pryor.

To compete against the luxury imports—including Mercedes, Jaguar, Volvo, Peugeot, Saab and Audi—Pryor and Cadillac chief en-

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1980

CEMBER 1980

Chilton's

AUTOMOTIVE INDUSTRIES

Low-Rev Truck Mill Ups MPG

WHAT... A PLASTIC ENGINE?

Materials '81

Form It With Dual-Phase • Grow Your Own Rubber • Mold It With Plastics

Chilton's
AUTOMOTIVE INDUSTRIES

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Matthew Holtzberg would love to show you his plastic engine.

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Structural plastics might offer an 1800-lb six-passenger car.

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A new, fast, accurate forge-welding technique is making news overseas.

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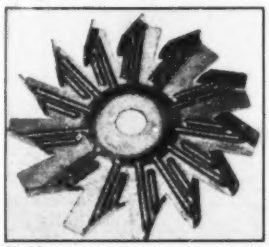
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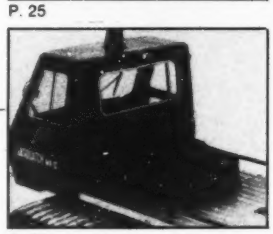
COVER

The amazing 'plastic' engine—a four-cylinder graphite/fiber/plastic composite creation of Polimotor Research—graces our cover.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NEXT MONTH

January AI offers: an in-depth forecast, a look at the profound changes ahead for Detroit, an introduction to the new honchos in D.C., and a seek/scan of car sound systems.

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Key Indicators

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AMC	9,049	13,973	143,230	152,977
Chrysler	88,843	65,280	535,664	613,973
Ford	152,832	190,835	1,070,916	1,943,531
GMC	416,575	428,099	3,430,342	4,382,728
VWoA	11,417	18,935	165,789	143,593
TOTAL	668,716	717,122	5,345,999	7,236,802
Imported Car Sales	175,089	163,388	1,936,034	1,883,140
Imported Car Penetration	21.7%	19.3%	25.8%	20.6%

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '79	Year to Date '80
New Orders	Sept	$ 78.1	$ 71.6	$670.5	$699.0
Shipments	Sept	76.2	72.1	664.9	661.1
Inventories	Sept	100.8	101.1	—	—
Unfilled Orders	Sept	273.5	271.8	—	—
Manufacturers Value of Shipments*					
Primary Metals, Total	Sept	$ 11.3	$ 10.6	$103.4	$106.2
Steel	Sept	5.2	4.6	47.3	52.7
Nonferrous Metal	Sept	5.1	5.0	46.6	43.3
Nonelectrical Machinery Equip. Industries, Total	Sept	14.3	13.6	125.3	117.5
Engines & Turbines	Sept	1.0	1.1	9.9	10.0
Farm Machinery & Equip.	Sept	1.1	1.1	9.8	10.2
Construction, Mining & Materials Handling Equip.	Sept	2.5	2.6	24.1	24.2
Metalworking Machinery	Sept	.9	.8	7.9	7.0
General Industrial Machinery	Sept	1.3	1.2	10.7	9.7
Transportation Equipment Industry, Total	Sept	15.3	14.3	130.0	148.4
Motor Vehicle & Parts	Sept	9.7	8.9	76.2	100.2
Aircraft, Missiles & Parts	Sept	4.8	3.9	36.9	32.5
Shipbuilding & Military Tank Vehicles	Sept	.8	.9	7.3	6.2
Fluid Power Eqpt. (Index 1972 = 100)	Sept	202.2	201.2	177.4	202.2
Machine Tools**					
Net new orders	Sept	$ .4	$ .2	$ 3.7	$ 4.1
Shipments	Sept	.4	.3	3.4	2.7

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).
**Cutting and forming, domestic and foreign.

Sources: U.S. Dept. of Commerce, Individual Motor Vehicle Mfgrs., National Fluid Power Assn., NMTBA.

redesigned transmissions. The Dasher diesel boasts the larger 1.6-L diesel engine, but retains the 1980 four-speed gearbox. The Vanagon and gasoline Dasher are basically unchanged. Jetta now comes standard with VW's passive restraint system.

Sales are forecast at 330,000 units with 198,000 Rabbits leading the way. Production of the popular pickup will nearly double with sales expected to reach 40,000, according to Richard Mugg, vice president of sales and marketing.

James McLernon, VWoA president, said that at a production level of 1040 cars and trucks a day to meet projected sales, the Westmoreland plant will be "capacity-constrained."

The new Sterling Heights, MI plant, a $300 million investment, is planned to go into pilot production in Spring, 1982, he revealed. In anticipation of the assembly lines going full tilt with the '83 models, VWoA is doubling the capacity of its stamping plant in West Virginia. It will begin sourcing diesel engines from Brazil in 1981 and gasoline engines from Mexico in 1982.

VWoA officials also said they have no plans to market either a 4x4 vehicle or a version of the small European Polo or Derby in the U.S.—*Paula D. Hodges*

GLC Gets Fwd And More Power

Mazda's first front-wheel-drive (fwd) car—the new GLC—is the star of the company's 1981 model lineup. The new 626 and RX-7 feature detail improvements and big gains in fuel economy this year, but the new-from-the-ground-up GLC steals the show.

When asked why Mazda waited so long to go fwd in an economy car, one Mazda official said, "We think it's been worth the wait." The GLC's development target, Mazda claims, was a car that was "fun to drive, comfortable and inexpensive to maintain."

Chilton
JANUARY 1981

AUTOMOTIVE INDUSTRIES

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STUMPING FOR A BORN-AGAIN INDUSTRY

Forecast '81

Regulators On The Run

Realism Hits UAW

Chilton's
AUTOMOTIVE INDUSTRIES

January, 1981/Volume 161, Number 1

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Dr. Richard John of DoT thinks the U.S. auto industry has seen the light.

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With survival of some companies at stake, UAW's future demands may mellow.

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The change sweeping Washington is sending hard-line regulators packing.

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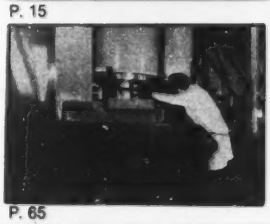
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COVER

Will Detroit win back the love of the American public? According to one DoT analyst, they will . . . but not without a little blood, sweat and tears. (Automobile courtesy of Buick Motors Div.; tennis outfit courtesy of Radnor Racquet Club. Photo by Jim Conroy.)

NEXT MONTH

Our February issue announces the 1981 winner of *AI*'s Career Achievement Award, features a preview of the SAE, plus an in-depth British Supplement on the UK auto industry.

abc AUTOMOTIVE INDUSTRIES (ISSN 0005-1527) magazine is published monthly by Chilton Co., Chilton Way, Radnor, PA 19089. Chilton Co. is a division of American Broadcasting Companies Inc., New York, NY. Subscription prices: United States and U.S. Possessions, $20.00 per year. $35.00 for 2 years; Canada $45.00; Other countries $55.00 per year. Air rates on request. Single copies and back issues on request. All subscription orders must be accompanied with cash or check, along with complete information for classification, including the title of the individual and the product the company manufactures. Controlled circulation postage paid at Philadelphia, PA 19104 and Salisbury, MD 21801. POSTMASTER: Send address changes to AUTOMOTIVE INDUSTRIES, P.O. Box 2055, Radnor, PA 19089.

Key Indicators

U.S. New Car Sales — Units

	Nov. '80	Nov. '79	Year to Date 1980	Year to Date 1979
AMC	9,618	12,697	163,436	165,602
Chrysler	52,740	51,422	719,854	1,016,752
Ford	122,356	148,109	1,424,481	2,077,465
GMC	329,793	367,560	3,844,478	4,593,389
VWoA	10,838	14,674	166,015	153,642
TOTAL	525,345	594,462	6,318,264	8,006,850
Imported Car Sales	168,028	167,593	2,212,634	2,149,246
Imported Car Penetration	24%	22%	26%	21%

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '79	Year to Date '80
New Orders	Oct	$ 80.7	$ 79.4	$780.3	$758.7
Shipments	Oct	79.4	76.6	744.7	747.9
Inventories	Oct	160.7	160.7	—	—
Unfilled Orders	Oct	276.4	275.0	—	—
Manufacturers Value of Shipments*					
Primary Metals, Total	Oct	$ 11.8	$ 11.3	$118.2	$115.2
Steel	Oct	5.8	5.2	58.4	52.9
Nonferrous Metal	Oct	5.0	5.1	48.4	51.8
Nonelectrical Machinery Equip. Industries, Total	Oct	14.6	14.6	131.4	140.3
Engines & Turbines	Oct	1.2	1.0	11.7	11.1
Farm Machinery & Equip.	Oct	1.2	1.1	11.4	11.1
Construction, Mining & Materials Handling Equip.	Oct	2.5	2.5	27.0	26.7
Metalworking Machinery	Oct	.9	.9	7.8	8.8
General Industrial Machinery	Oct	1.3	1.3	11.0	12.1
Transportation Equipment Industry, Total	Oct	16.3	15.3	165.2	147.5
Motor Vehicle & Parts	Oct	9.9	8.7	111.5	87.3
Aircraft, Missiles & Parts	Oct	4.7	4.8	36.1	41.6
Shipbuilding & Military Tank Vehicles	Oct	.7	.8	6.9	8.1
Fluid Power Eqpt. (Index 1972 = 100)	Oct	206.5	202.2	180.0	—
Machine Tools**					
Net new orders	Oct	$ .3	$ .4	$ 4.7	$ 4.0
Shipments	Oct	.4	.4	3.1	3.8

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).

**Cutting and forming, domestic and foreign.

Sources: U.S. Dept. of Commerce, Individual Motor Vehicle Mfgrs., National Fluid Power Assn., NMTBA.

possible to destroy.

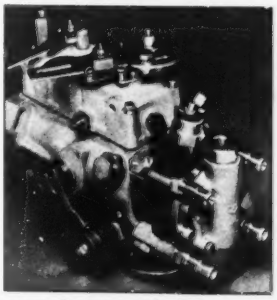
GCA Technology Corp., Bedford, MA, conducted a verification burn at GM's Chevrolet Bay City plant and effectively destroyed 99.9% of the PCB contained in waste oil.

Analysis of the boiler's stack emissions confirmed this. Sophisticated ambient air quality monitoring equipment showed no contribution of PCBs to the air surrounding the plant as a result of the test burn.

Dr. Betsy Ancker-Johnson, vice president of GM's Environmental Activities Staff called the test "an unqualified success. We beleive that burning the chemical offers one of the best available technologies for destroying it with the least risk. By destroying PCBs permanently, there is no way they can harm our environment in the future. Furthermore, this method produces an energy benefit by utilizing PCB waste oil to generate steam," she added.

Rotary Pump Smooths Diesel Drive

A new rotary fuel injection pump for diesel engines has been introduced by Lucas CAV of England. Called the DPS, it is suitable for high-speed diesels rated up to 30



Lucas' rotary fuel injection pump provides direct response fuel metering to the accelerator pedal and more consistent engine idling speed.

STARTING THE UPHILL DRIVE

Signs are pointing to a recovery in 1981. But there are flashing lights, warning signals and reduced speed along the way.

by Ira G. Black

Just keep telling yourself, "It's going to get better, it's going to get better." Because it probably will.

At least that's where the signs are pointing.

Naturally, there are some caveats. The most prevalent, of course, being the one which says any recovery in 1981 will be moderate. And, as a corollary, that it won't really pick up much speed until the second half.

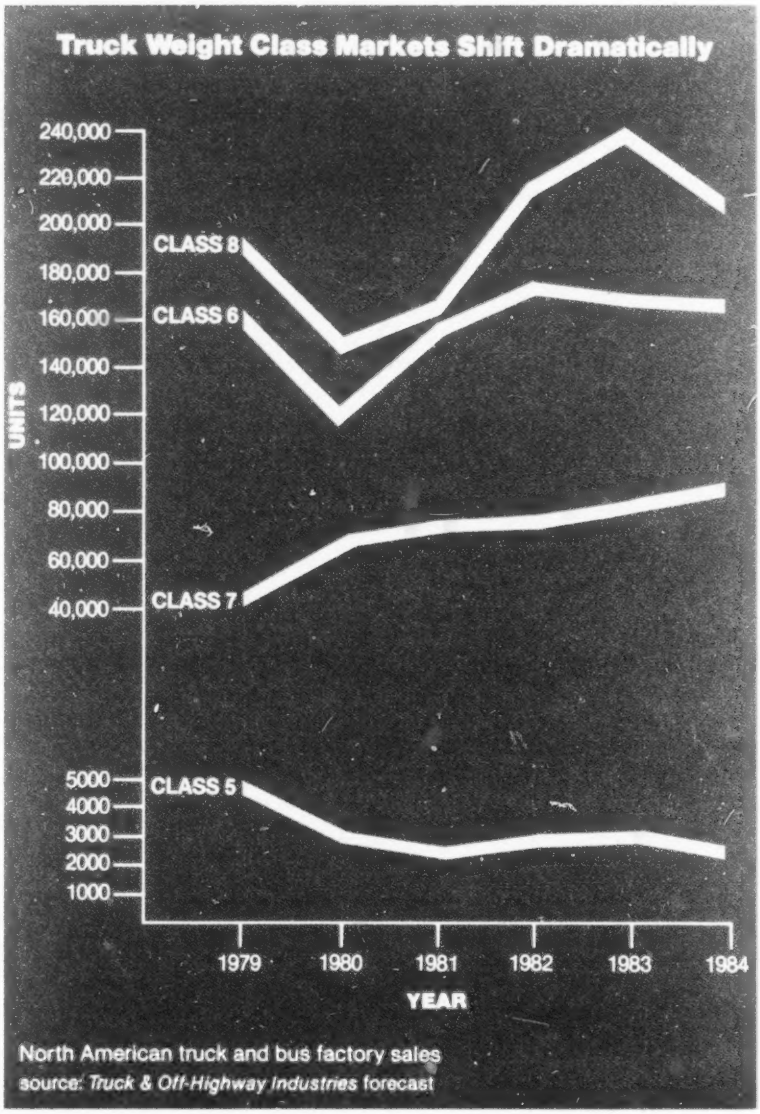
There are other road blocks, too.

Say economists at Chase Manhattan Bank, "The major threat to recovery clearly is inflation." And as if to caution against premature bursts of ***Happy Days Are Here Again***, they add "The belief is growing that the 1980 recession is over. At the same time there is a considerable amount of pessimism about the probable speed and durability of economic recovery. This concern largely reflects the inflation that is central to most of America's pressing problems. That inflation is still very much alive."

Warning Flags Raised

The scary part in all this is that the apparent recovery could very well falter at any time. Warns the University of Michigan's Dr. Ross Wilhelm, "There are events on the horizon that could cut off the recovery ... and throw us into another downturn—a double dip recession."

The keys here are spending and, again, inflation. The fear is that ex-



North American truck and bus factory sales
source: *Truck & Off-Highway Industries* forecast

pensive money will put a drag on both consumer and business spending. There is a tendency for car-buyers to spend less of their income for cars when general economic conditions are bleak, and a larger portion when economic buoyancy is the order of the day.

Dr. Wilhelm observes, "A double dip recession will hurt automobile sales even though the new fuel-efficient 1981 models have improved the industry's ability to compete."

Chase, with an eye to possible consumer price rises of 10% to 11%, comments, "Rates higher than that, if sustained, could easily retard consumption and help bring on renewed recession. Even expectations of faster inflation—in advance of the fact—could have the same effect by pushing interest rates much higher."

Although Wharton Econometric Forecasting Associates Inc. (WEFA) is predicting a very moderate recovery in 1981, it too raises a couple of warning flags. WEFA notes that although inflation has fallen from the highs posted earlier in '80, "Further progress will be slow. Wages continue to rise rapidly despite increased unemployment because of past inflation and because productivity remains stagnant."

WEFA's predictions are for inflation to average 9.1% in 1981 (as measured by the GNP implicit deflator) and for unemployment to peak at 8.6% in mid-'81 and then decline.

Oil Plays Its Part

Other caveats in the recovery picture include oil prices and oil supply, coupled with continued instability in the Middle East.

The Chase Manhattan outlook indicates that "petroleum prices are expected to rise substantially in early '81, reflecting reduced world supplies as well as the continuation of price decontrol in the United States."

The other side of the coin on soaring oil prices, of course, is that these higher prices may prod more and more people into trading in the old gas guzzler for something more fuel efficient.

Wharton's Larry Klein sees OPEC fuel prices moderating over the long term, dropping from 1980's 65% down to 20% for the year ahead, and finally dipping to 8% by mid-decade. Even so, that 20% figure for 1981 could mean a significant boost very soon.

Another factor that will tend to moderate any recovery is the spate of federal government regulations in the pipeline. In addition to those which will impinge directly on automotive product, there are a host of others which, according to Washington University's Murray L. Weidenbaum, "will generate additional cost-push pressures." Among them: Toxic Substances Act, Resource Conservation and Recovery Act. Clean Air Amendments, Clean Water Amendments, and OSHA's new Generic Carcinogenic Standard.

Add to these, Jan. 1 hits in Social Security taxes and in the statutory minimum wage.

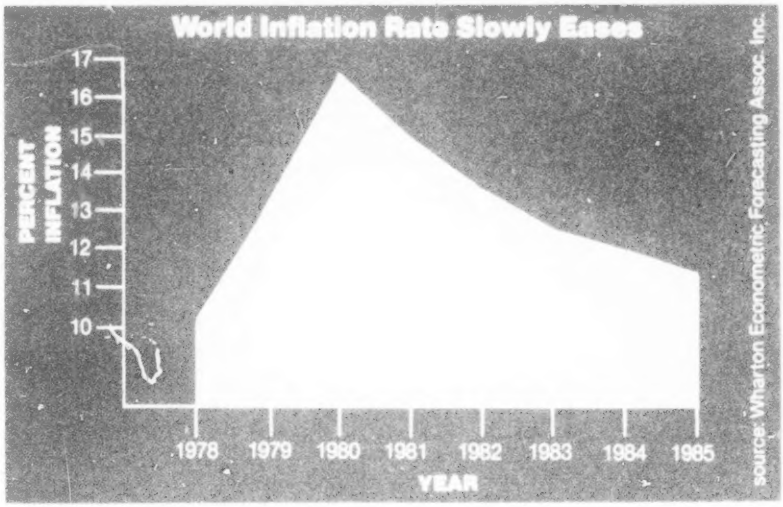
Weakening growth in the major industrialized nations of the world could also contribute to a slowed U.S. recovery.

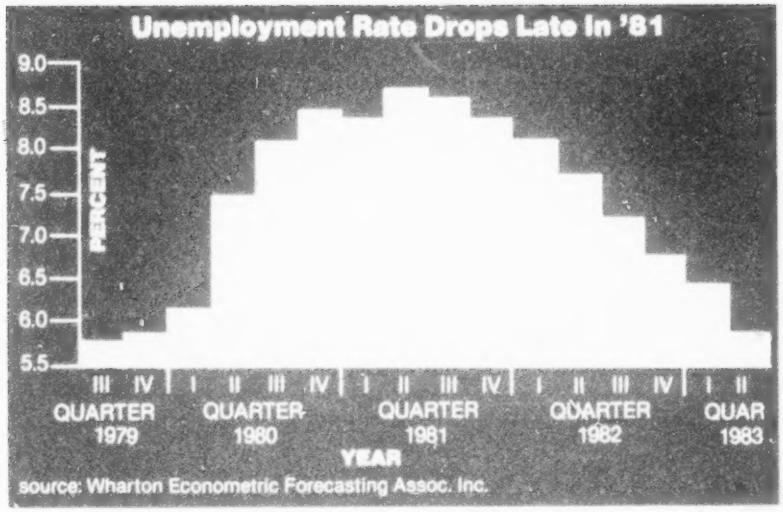
Europe is currently catching the backwash of the U.S. recession—although it's not expected to hit anywhere near the deep troughs the U.S. version has. However, any slowdown in Europe is almost certain to trigger a decline in U.S. exports.

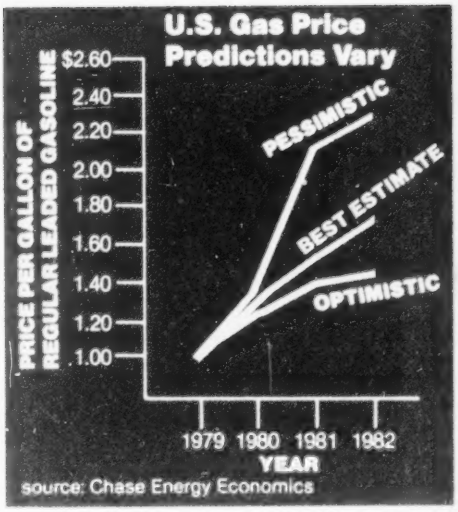
On The Bright Side

But all this is on the dark side. On a more optimistic note, there are just as many reasons to expect that the economy, and vehicle sales right along with it, will trend on the upside.

As Standard & Poor's enthuses, "Although the auto industry sustained its first loss in 1980 since the depression of nearly 50 years ago, the group should reenter the black in 1981 as demand continues to recover from the cyclical bottom of last May, recent major economy measures become increasingly effective, and aggressive pricing moves help offset rising wage, materials,







depreciation, and tooling amortization costs."

Add to this list laudable product innovation programs being launched with considerable vigor by automakers, pent-up demand pressures from the marketplace and an incoming administration which gives every indication of turning things around.

Additionally, used car prices are forecast to rise still further in '81—especially as new car prices continue to creep upward. And bigger trade-in allowances traditionally aid new car sales.

Sales Picture

Motor vehicle sales forecasts range all over the map. Estimates of 1981 sales of passenger cars (imports and domestic) and light trucks run from just over 9 million to more than 13 million. *Automotive Industries* predicts '81 sales of 11.3 million.

The expected 1981 recovery also carries over into the heavy-duty side of the industry. And, as with autos, second half '81 will likely be the turning point.

While a fairly decent comeback is in the cards for most truck sizes in 1981, for the long-haul, demand outlook for the big rigs looks a lot more promising than it does for the smaller stuff.

For construction and industrial vehicles, roadbuilding equipment and mining equipment, 1981 holds out a mixed bag. If money doesn't get too much tighter and housing starts don't slip entirely down the tubes, construction and industrial vehicles could see a modest uptick from 1980's dismal performance.

Roadbuilding equipment will likely continue its downslide as the federal government yanks the rug out from under new highway construction. *AI*'s sister publication, *Truck & Off-Highway Industries*, is predicting a 6.6% decline in unit deliveries during '81 in that sector.

TOHI also believes heavy surface mining machinery will clock in with a continued slow but steady growth rate in the year to come—especially as it's the sole segment of the business that's not particularly recession-related.

For heavy duty overall, it's a tricky scenario. Interest rates, government expenditures of an incoming administration, housing starts, non-residential construction, inflation and the economy in general all have considerable impact on the outlook for the year ahead.

The one bright spot is, of course, exports. Though even that will hinge dramatically on how hard the U.S. recession backwash hits overseas.

RVs Looking Up

There's at least one segment of the industry that's looking eagerly toward the coming year—recreational vehicles.

Odd as that may sound, United California Bank predicts RV shipments will total 240,000 units in 1981, a whopping 29.7% increase over 1980 levels—a year which registered a precipitous 40% plunge from 1979 levels.

Bank economist Raymond Jallow declares RV shipments will be buoyed by the recovery in the overall economy and the moderation of gasoline price increases, as well as by relatively lower interest rates in 1981 compared with 1980. ■

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FEBRUARY 1981

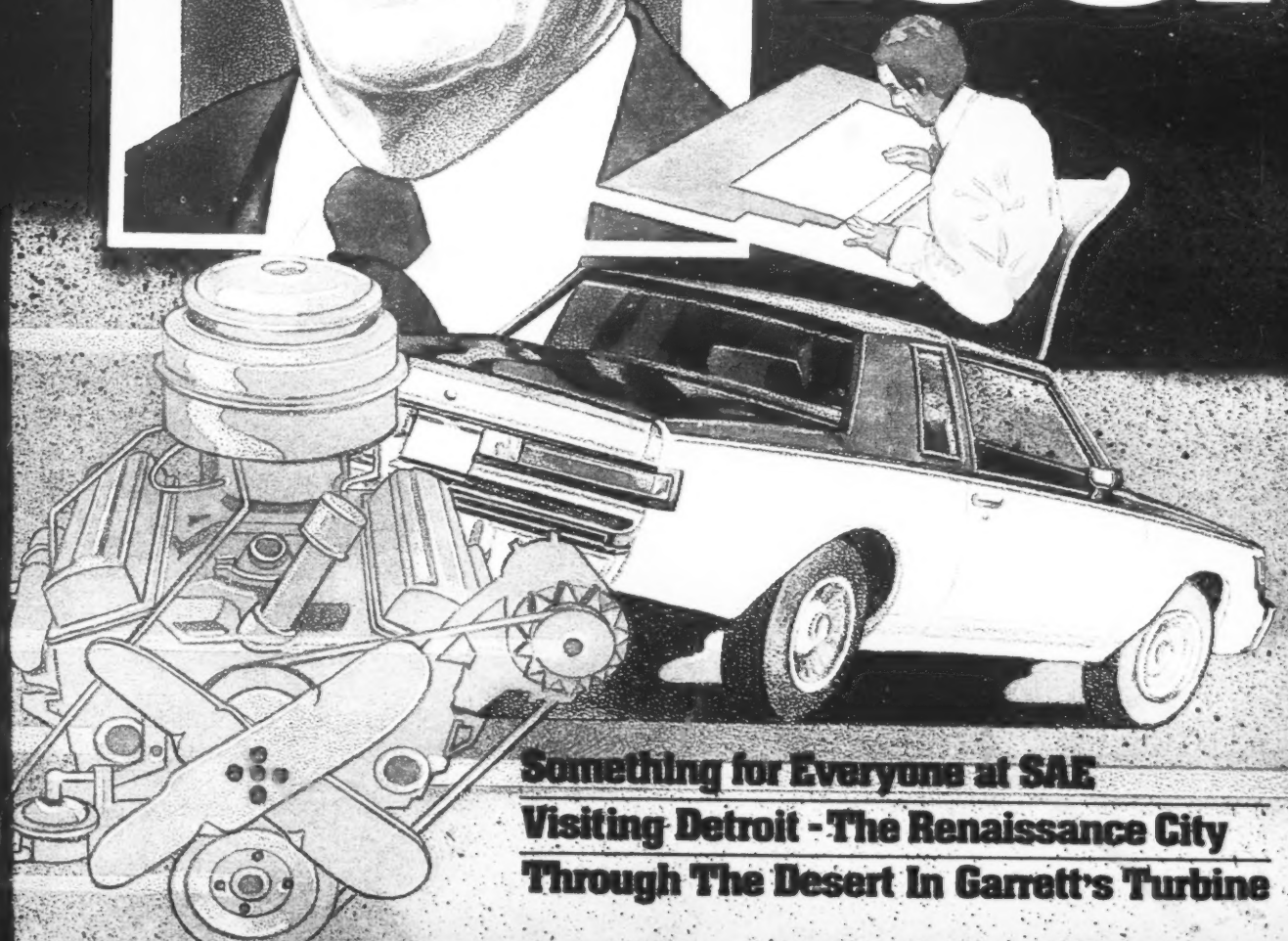
Chilton's

AUTOMOTIVE INDUSTRIES

Special Supplement:
BRITISH AUTO-MOTIVE ENGINEERING

Donald H. McPherson
VP & Group Executive
General Motors Corp.

Man of the Year 1981



Something for Everyone at SAE

Visiting Detroit - The Renaissance City

Through The Desert In Garrett's Turbine

Chilton's AUTOMOTIVE INDUSTRIES

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GM's Don McPherson is the winner of *AI*'s 1981 Career Achievement Award.

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100 Visiting Renaissance City
There's more to see in Detroit than just Cobo Hall.

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Michael May's engine reportedly gets better economy than a diesel.

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Pressure-sensitive tape solves the problems of attaching trim.

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A new generation of hot and cold forming increases operating speeds.

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Many problems have forced development of new cat converter alloys.

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Plastic glazing is making inroads in windows and headlamps.

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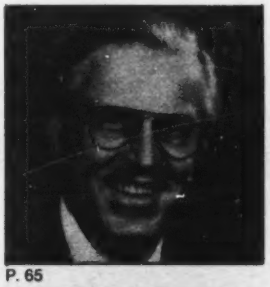
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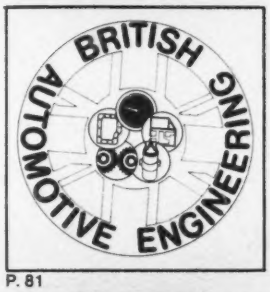

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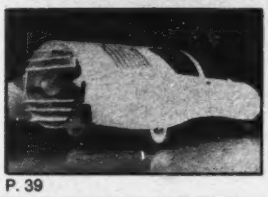
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COVER

Man of the Year Don McPherson, GM's new group executive, has a varied background at Chevy engineering, and more recently at the helm of Buick Div.

NEXT MONTH

March *AI* looks at robotics and GM's productivity push, the Fords in our future and current research into alternate engines.

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Key Indicators

U.S. New Car Sales — Units

	Dec. '80	Dec. '79	Year to Date 1980	Year to Date 1979
AMC	4,103	9,621	124,379	158,673
Chrysler	31,906	49,227	638,973	906,675
Ford	111,626	75,674	1,306,949	2,006,837
GMC	302,189	299,857	4,064,566	5,069,812
VWoA	15,603	15,033	198,484	173,192
TOTAL	**465,427**	**449,412**	**6,333,351**	**8,315,189**
Imported Car Sales	168,028†	167,593†	2,212,634†	2,149,246†

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '79	Year to Date '80
New Orders	Nov	$ 81.8	$ 80.7	$853.4	$837.0
Shipments	Nov	80.3	79.5	817.4	827.2
Inventories	Nov	160.7	160.1	—	—
Unfilled Orders	Nov	277.3	275.8	—	—
Manufacturers Value of Shipments*					
Primary Metals, Total	Nov	$ 12.4	$ 11.8	$129.4	$126.8
Steel	Nov	6.3	5.8	63.7	58.6
Nonferrous Metal	Nov	5.0	4.9	53.2	56.5
Nonelectrical Machinery Equip. Industries, Total	Nov	14.8	14.8	143.9	154.5
Engines & Turbines	Nov	1.2	1.2	12.2	12.2
Farm Machinery & Equip.	Nov	1.2	1.2	12.3	12.0
Construction, Mining & Materials Handling Equip.	Nov	2.4	2.6	29.3	29.0
Metalworking Machinery	Nov	.9	1.0	8.7	9.8
General Industrial Machinery	Nov	1.2	1.3	12.1	13.2
Transportation Equipment Industry, Total	Nov	16.3	16.4	180.5	164.4
Motor Vehicle & Parts	Nov	9.8	9.9	121.2	97.7
Aircraft, Missiles & Parts	Nov	4.7	4.8	39.8	46.4
Shipbuilding & Military Tank Vehicles	Nov	.7	.7	7.7	8.8
Fluid Power Eqpt. (Index 1972 = 100)	Nov	207.4	206.5	182.5	—
Machine Tools**					
Net new orders	Nov	$ .3	$ .3	$ 5.1	$ 4.4
Shipments	Nov	.4	.4	3.5	4.2

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).

**Cutting and forming, domestic and foreign.

†November figures are latest available.

Sources: U.S. Dept. of Commerce, Individual Motor Vehicle Mfgrs., National Fluid Power Assn., NMTBA.

Reagan with impressive business credentials, is expected to take firm and quick command of his department.

A Main Line Philadelphian who stands out in the cadre of Californians and Texans surrounding the President, "Drew" Lewis is the first certified businessman to run the Department in recent memory.

He founded Lewis & Associates, a management and financial consulting firm which advises Brinks Inc. and Builders Investment Corp. among others. He holds a number of corporate directorships.

As a troubleshooter, he was brought in as president and chief executive officer at

Transportation Secretary Andrew Lindsay Lewis III is the first certified businessman to run the Department of Transportation in recent memory. He is expected to take firm control.

both Snelling and Snelling Inc. and Simplex Wire and Cable Co. where he successfully reversed downward trends.

Since 1971, he has served as trustee and co-chief executive officer for the Reading Co. under reorganization proceedings. Reading was a freight and mass transit carrier with two interstate trucking subsidiaries.

Lewis holds a Master's in Business Administration from Harvard Graduate School of Business and a Bachelor of

MARCH 1981

Chilton's

AUTOMOTIVE INDUSTRIES

Exclusive Report:
Inside Lucas' Microjector Plant

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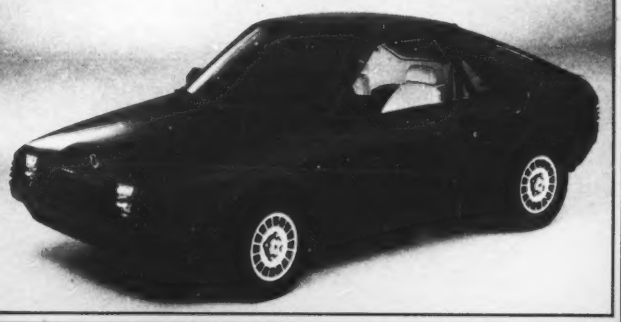
Special Don Kopka Interview
The Fords In Our Future



GM'S PRODUCTIVITY PUSH
THE ROBOT INVASION

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AUTOMOTIVE INDUSTRIES

March, 1981/Volume 161, Number 3

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Japanese competition has made America's largest automaker look for ways to improve productivity. Robots offer the greatest promise.

41 Inside GM's Robot Extravaganza
Although GM's World Productivity Conference was closed to the media, *AI* got an exclusive guided tour.

49 Quality Buzzes at Greenville's Microjector Plant
This special report describes some of the advanced manufacturing technology Lucas CAV will employ at its U.S. Microjector plant.

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According to Don Kopka, Ford's new vice president of design, future cars may be very similar to the company's sleek show cars.

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With high efficiency taking on more importance daily, GM and Ford are taking a closer look at alternate engines.

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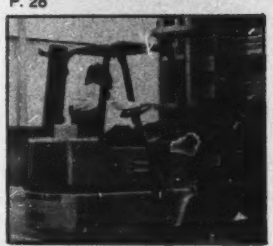

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COVER

GMAD's use of welding robots at its Wilmington, DE Chevette plant is just one example of a growing trend. Inset: Ford's two-seat Super Gnat prototype.

NEXT MONTH

Our April issue contains specifications on just about any vehicle available in the U.S. Also next month, *AI* gets Motorcycle Madness!

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Goldschmidt Leaves An Auto Survival Plan

Industry Projects New Product Spending

	Facilities Count 1979/80	Facilities Projection 1985/86	Number New (Modified) Lines	Cost per New (Modified) Line (in millions)	Total Cost (in millions)	
Engine Lines						
<4-cyl.	—	1	1			
4-cyl.	4	22	18(4)	$260	$8,580	
6-cyl. (L-6)	6	—	—	(130)	(520)	
6-cyl. (V-6)	2	15	13			
8-cyl.	28	2	1			
Total	**40**	**40**	**33(4)**			**$9,100**
Transmission Lines						
Automatic						
Rear-drive 3-speed	25	2				
Rear-drive 4-speed	1	4	3	$266	$6,118	
Front-drive	2	22	20			
Manual						
Rear-drive	7	4				
Front-drive	1	4	3	$75	225	
Total	**36**	**36**	**26**			**$6,343**
Platform Assembly & Stamping						
Rear-drive vehicles	75	20	4(6)	$230	$13,570	
Front-drive vehicles	5	60	55	(195)	(1,170)	
Total	**80**	**80**	**59(6)**			**$14,740**
Components						
Front-drive	3	30	27	$700	$18,900	
Rear-drive	37	10	(5)	(350)	1,750	
Total	**40**	**40**	**27(5)**			**$20,650**
Plastics Processing	**19**	**38**	**19**	**$200**	**$3,800**	**$3,800**
Aluminum Foundries	**12**	**23**	**11**	**$150**	**$1,650**	**$1,650**
Grand Total						**$56,283**

Source: Transportation Systems Center. Compiled from industry program plans

by Paula D. Hodges

Predicting it will take a minimum of five years for the auto industry to return to full competitive strength, outgoing Transportation Secretary Neil Goldschmidt left a somber status report and ambitious plan on the desk of his successor, Drew Lewis.

Among the grim findings of the year-long auto industry study are:

- The industry needs $70 billion in capital improvements by 1985 of which $56 billion is new product spending (see chart).
- Intense foreign competition will continue in the U.S. market.
- Consumer demand will remain uncertain due to energy supply and price and an unpredictable economy.
- 500,000 jobs will be lost in the next decade.

Much of the survival plan, which calls for a new industry/labor/government compact, should find favor in the new Administration which has pledged to aid the industry. Favorable reaction came immediately from Congressmen representing auto-producing states.

Calling the auto industry essential to national security, Goldschmidt proposed that government negotiate an import restraint agreement with the Japanese, his most controversial recommendation. The study found that Japanese automakers have a cost advantage of $1000 to $1500 per unit because of higher productivity, lower wages and favorable government regulations.

He also proposed that government help the industry obtain the capital it needs, possibly through a re-industrialization finance corporation; revised tax laws; a reformed regulatory approach and redefined antitrust laws so as not to "unwittingly hamstring" domestic companies in international competition.

Labor unions should hold down wage demands, support measures to increase productivity—even if it costs jobs—and promote worker retraining and re-employment, he recommended.

Goldschmidt proposed to Detroit that the industry restructure its relationship with labor. Without a new working agreement, cooperation between government and management will be worthless. The industry should also recognize labor wage restraints by setting up profit sharing programs or other forms of compensation, he said.

On the productivity front, he said it will take an aggressive effort by American managers to realize gains already made by the Japanese in equipment utilization, plant design and product and process technology. Without those gains, he said, "our competitive position—regardless of a period of trade restraint, wage restraint and retooling—will continue to deteriorate."

Goldschmidt also called for Detroit to intensify research and development, claiming U.S. companies are in a catch-up position.

He also concluded that brakes should be put on the

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Key Indicators

U.S. New Car Sales — Units

	Jan. '81	Jan. '80	Year to Date 1981	Year to Date 1980
AMC	6,639	9,445	6,639	9,445
Chrysler	41,725	47,805	41,725	47,805
Ford	97,698	81,777	97,698	81,777
GMC	295,934	377,002	295,934	377,002
VWoA	12,430	5,682	12,430	5,682
TOTAL	454,426	521,711	454,426	521,711
Imported Car Sales	177,800†	171,300†	2,398,280†	2,332,295†

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '79	Year to Date '80
New Orders	Dec	$ 82.5	$ 81.1	$926.6	$914.5
Shipments	Dec	79.5	79.7	887.8	902.2
Inventories	Dec	161.9	161.0	—	—
Unfilled Orders	Dec	280.1	277.1	—	—
Manufacturers Value of Shipments*					
Primary Metals, Total	Dec	$ 12.6	$ 12.3	$140.1	$138.0
Steel	Dec	6.6	6.3	68.7	64.5
Nonferrous Metal	Dec	4.8	4.9	58.0	60.9
Nonelectrical Machinery Equip. Industries, Total	Dec	14.6	14.7	157.7	169.2
Engines & Turbines	Dec	1.1	1.2	13.2	13.3
Farm Machinery & Equip.	Dec	1.2	1.2	13.3	13.0
Construction, Mining & Materials Handling Equip.	Dec	2.7	2.5	31.8	31.6
Metalworking Machinery	Dec	.9	1.0	9.5	10.8
General Industrial Machinery	Dec	1.3	1.2	13.2	14.5
Transportation Equipment Industry, Total	Dec	15.6	16.1	194.5	179.0
Motor Vehicle & Parts	Dec	9.5	9.7	129.4	105.9
Aircraft, Missiles & Parts	Dec	4.5	4.7	43.8	51.1
Shipbuilding & Military Tank Vehicles	Dec	.7	.7	8.7	9.7
Fluid Power Eqpt. (Index 1972 = 100)	Dec	211.3	207.4	184.6	—
Machine Tools**					
Net new orders	Dec	$ .3	$ .3	$ 5.5	$ 4.7
Shipments	Dec	.5	.4	3.9	4.7

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).
**Cutting and forming, domestic and foreign.
†Figures listed are for Dec. and year-end 1980.
Sources: U.S. Dept. of Commerce, Individual Motor Vehicle Mfgrs., National Fluid Power Assn., NMTBA.

rate at which new regulations are imposed. "As a matter of national priorities, for a specific period of time, we should focus our efforts and our capital first on preserving our industrial base and our jobs." ■

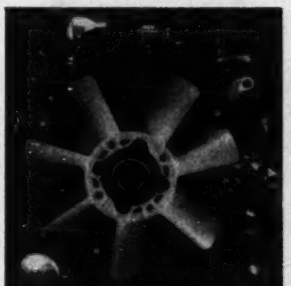
GM Enters Subcompact Diesel Market

by Jennifer M. George

Seven thousand diesel-powered Chevettes will be introduced this year by General Motors' Chevrolet Div. Production begins this month at GM's assembly plant in Wilmington, DE and at Lakewood, GA in April.

The engine is a 1.8-L (111-in.³) Isuzu coupled to a five-speed manual Isuzu transmission. GM estimates the Chevette will get 55 mpg highway/40 city (4.3/5.9 L/100 km). Also available is an optional three-speed automatic gearbox rated at 41 mpg highway/35 city (5.7/6.7 L/100 km).

The engine develops 51 hp at 5000 rpm with a torque rating of 72 lb-ft at 2000 rpm. A 110-volt block heater is standard equipment to help the diesel start at temperatures as low as −10°F (−23°C) with no special procedures. Maximum wait for the glow plugs is 5 to 10 seconds.



The 1.8-L (111-in.³) Isuzu diesel will power about 7000 Chevettes this year and another estimated 42,000 in model year '82.

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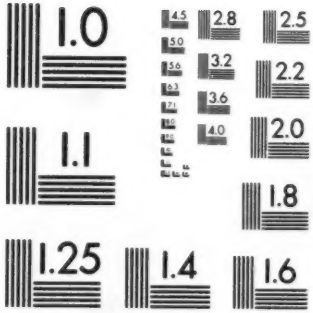

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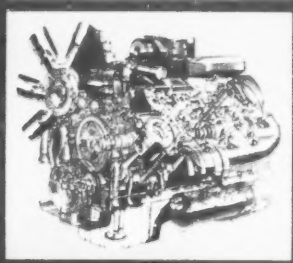

63rd Annual SPECIFICATIONS AND STATISTICS ISSUE

INSIDE GM'S J-CAR

- The Rationale
- The Engine & Suspension
- The Fits & Finishes Fix

Cimarron by Cadillac

Chilton's
AUTOMOTIVE INDUSTRIES

April, 1981/Volume 161, Number 4

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55 GM Launches Its J-Car
Four separate features describe the marketing, engine design, suspension tuning and quality control program behind the J-car.

64 Motorcycle Madness
AI takes a pictorial look at the newest designs in cycles from Japan, Germany, Britain and the U.S.

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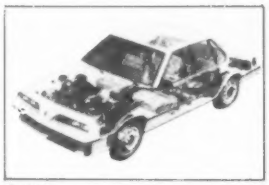

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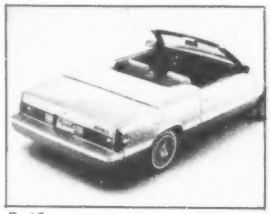

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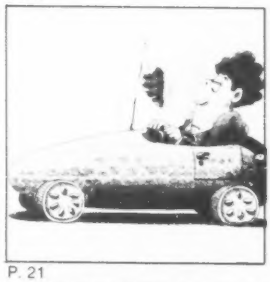

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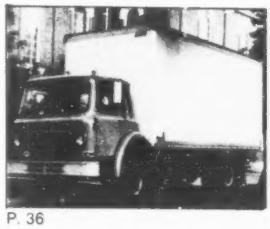
COVER

GM's top-of-the-line J-car, the Cimarron by Cadillac, plus a sampling of all the different vehicles included in our specs, grace *AI's* cover.



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next month

In May we tackle the international automotive scene plus preview the SITEV '81 show in Geneva.

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Key Indicators

U.S. New Car Sales — Units	Feb. '81	Feb. '80	Year to Date 1981	Year to Date 1980
AMC	8,427	9,835	15,066	19,290
Chrysler	63,225	57,413	104,950	105,218
Ford	121,172	134,024	218,870	215,801
GMC	330,957	371,633	629,891	748,835
VW&A	15,496	15,426	27,926	21,108
TOTAL	539,277	588,531	996,703	1,110,242
Imported Car Sales	219,805	219,456	396,977	436,886
Imported Car Penetration	28.9%	27.2%	28.5%	28.2%

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '79	Year to Date '80
New Orders	Jan	$ 81.1	$ 82.7	$ 926.9	$ 914.7
Shipments	Jan	80.4	80.0	887.8	902.7
Inventories	Jan	164.9	161.9	—	—
Unfilled Orders	Jan	280.5	279.7	—	—
Manufacturers Value of Shipments*					
Primary Metals, Total	Jan	$ 12.5	$ 12.6	$ 140.1	$ 137.9
Steel	Jan	6.2	6.6	68.7	64.4
Nonferrous Metal	Jan	5.2	4.9	58.0	60.9
Nonelectrical Machinery Equip. Industries, Total	Jan	15.4	14.7	157.7	169.3
Engines & Turbines	Jan	1.4	1.1	13.2	13.4
Farm Machinery & Equip.	Jan	1.2	1.1	13.3	12.9
Construction, Mining & Materials Handling Equip	Jan	2.8	2.7	31.8	31.5
Metalworking Machinery	Jan	.9	.9	9.5	10.8
General Industrial Machinery	Jan	1.4	1.2	13.2	14.5
Transportation Equipment Industry, Total	Jan	15.5	15.8	194.5	179.2
Motor Vehicle & Parts	Jan	9.3	9.6	129.4	106.0
Aircraft, Missiles & Parts	Jan	4.3	4.5	43.8	51.1
Shipbuilding & Military Tank Vehicles	Jan	.9	.8	8.7	9.7
Fluid Power Eqpt. (Index 1972 = 100)	Jan	214.5	211.3	—	—
Machine Tools**					
Net new orders	Jan	$ .3	$ .3	$ —	$ —
Shipments	Jan	.4	.5	—	—

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).

**Cutting and forming, domestic and foreign.

Sources: U.S. Dept. of Commerce, Individual Motor Vehicle Mfgrs., National Fluid Power Assn., NMTBA.

Response at early design clinics in Europe was so favorable that Ford may even go head to head against European sport coupes on their home turf in the near future. In the meantime, Ford is hoping for spring fever in the home market. ■

McPherson Honored At AI Luncheon

by Jennifer M. George

Over a steak luncheon and the best chocolate eclairs the Detroit Athletic Club could bake up, about 220 automotive executives helped *Automotive Industries* honor its Man of the Year with a Career Achievement Award. This year's recipient was Donald McPherson, vice president of General Motors' car and truck divisions.

AI's editor-in-chief, Ira Black, presented the 18th annual award, explaining, "Despite the worst industry slump since the Great Depression a half century ago, Buick sales, on a calendar year basis, performed phenomenally under his [McPherson's] management. 1980 sales were actually up over the previous year's tally, hitting a most respectable 720,000 units. Also during the 1980 model year, Buick was the only GM division and only Big Three carmaker to increase its market share. That penetration rose from 6.9 to 7.6%."

McPherson, who was group leader in Chevrolet's drafting department during the designing of Chevy's first small block V-8, stressed that to be effective in a vast worldwide arena, the auto industry must excel in four areas. "First, we must have the products to enter the worldwide competition. They must be the right products for the time.

(Continued)

the tax rate would be: (80 − 26) = 54 x 30¢ = $16.20 x 80 for a total tax of $1296. The same vehicle now pays only $240.

The method of calculating the tax would also be changed from the current practice of inferring gross weight from empty weight. Instead, gross weight would be taxed directly.

● Fuel. The present fuel tax of 4¢ per gallon transferred to the Trust Fund would increase to 6¢. But in keeping with a Carter Administration proposal, DoT still wants to increase overall fuel taxes by 10¢ to a total of 14¢ as a general energy conservation tax measure. The difference between the receipts from the 6¢ and the total fuel receipts would go to the General Fund.

Taxes on lubricating oil would be dropped and those on tires, tubes and tread rubber would remain the same under the DoT proposal.

The Department also recommends that the gasohol exemption remain at 4¢, and that Congress look at it and other exemptions to the user tax structure because their revenue impact is substantial.

The last major review of the highway tax structure was in 1956. ■

Japan Estimates '81 Production

by John R. Hartley

Last year, Japan produced 11 million vehicles to finish well above the U.S. as the top auto producing country. This year, the aggregate of the production targets for the various manufacturers amounts to 11.3 million units. But don't be surprised if this turns out to be an underestimation.

Mitsubishi expects a 2.6% decline in exports this year due to Chrysler's inability to sell as many cars in the U.S. Large increases are hoped for by Daihatsu, Suzuki and Fuji Heavy Industries, reflecting the increasing demand in Japan and elsewhere for 550 cm^3 (33 $in.^3$) engined vans and passenger cars.

It is likely that exports will be rather higher all around than predicted, while domestic sales will be 1-4% lower. ■

Japanese Estimates For Auto Production In '81

	Production Target (inc. % over '80)	Exports (inc. % over '80)
Toyota	3.3 mil. (0.2%)	1.7 mil (−4.8%)
Nissan	2.69 mil (1.6%)	1.48 mil (1.0%)
Toyo Kogyo	1.13 mil (0.8%)	0.73 mil (4.4%)
Mitsubishi	1.1 mil (0.6%)	0.555 mil (−2.6%)
Honda	1.0 mil (7.3%)	0.68 mil (7.0%)
Suzuki	0.52 mil (11%)	0.12 mil (24.9%)
Isuzu	0.5 mil (6.3%)	0.29 mil (5.7%)
Daihatsu	0.48 mil (10.6%)	0.16 mil (12%)
Fuji Heavy	0.46 mil (7.6%)	0.24 mil (3.4%)
Hino	0.07 mil (0%)	0.03 mil (7.9%)
Nissan Diesel	0.05 mil (13%)	0.025 mil (27%)

New Carb Claimed To Get 13% Better Mpg

Fuel Systems Management, Sunset Whitney Ranch, CA, claims to have developed a revolutionary concept in carburetion adaptable to autos, trucks, motorcycles, marine and industrial uses.

Tests were conducted under the supervision of Jerry Coker, vice president, test operations of Olson Engineering.

Results showed that the carburetor

(Continued)

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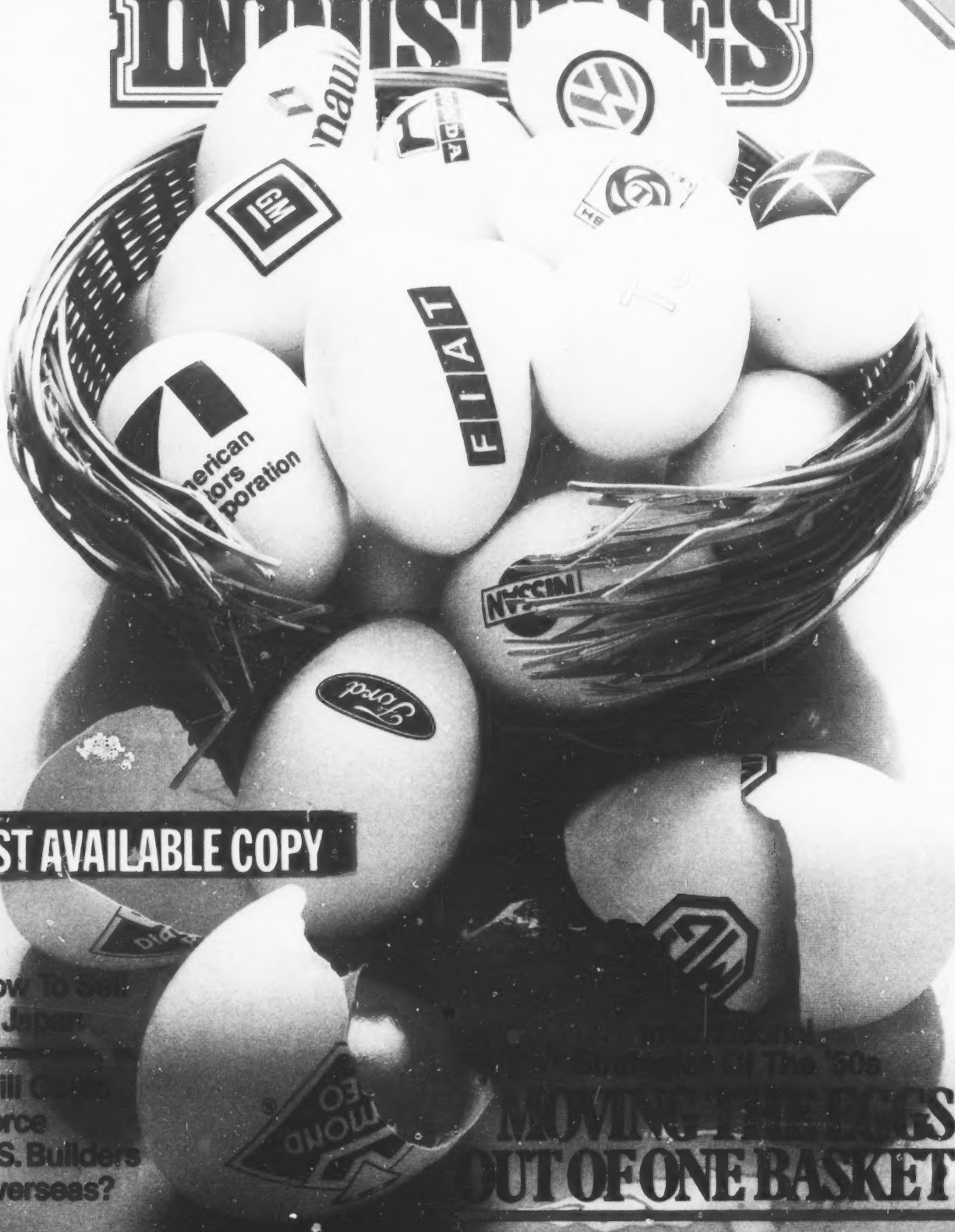
AUTOMOTIVE INDUSTRIES

Ford's Petersen: 'A Break In The Clouds'



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How To Sell In Japan

Will Currency Force U.S. Builders Overseas?

The '50s

MOVING ... OUT OF ONE BASKET

Chilton's
AUTOMOTIVE INDUSTRIES

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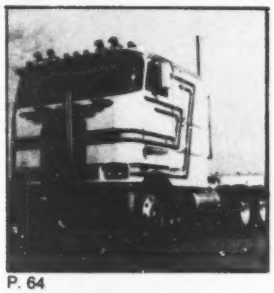
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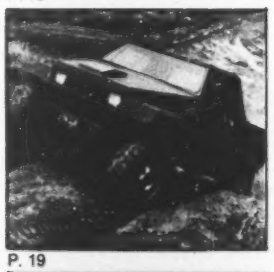
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COVER

"Don't put all your eggs in one basket" is some good advice most of the world's top vehicle makers seem to be following.

NEXT MONTH

June features *AI's* sixth annual Source Guide, Company Profiles and Financial Analysis of automotive suppliers.

abc AUTOMOTIVE INDUSTRIES (ISSN 0005-1527) magazine is published monthly by Chilton Co., Chilton Way, Radnor, PA 19089. Chilton Co. is a division of American Broadcasting Companies Inc., New York, NY. Subscription prices: United States and U.S. Possessions—$25.00 per year, $45.00 for 2 years; Canada and Foreign—$65.00 per year. Air rates on request. Single copies and back issues on request. All subscription orders must be accompanied by cash or check, along with complete information for classification, including the title of the individual and the product the company manufactures. 2nd class postage paid at Philadelphia, PA 19104 and additional mailing offices. POSTMASTER: Send address changes to AUTOMOTIVE INDUSTRIES, P.O. Box 2055, Radnor, PA 19089.

Key Indicators

U.S. New Car Sales — Units — **Year to Date**

	Mar. '81	Mar. '80	1981	1980
AMC	17,440	19,204	45,841	47,161
Chrysler	107,383	94,043	250,486	239,202
Ford	166,548	174,829	396,090	449,698
GMC	437,884	390,371	1,062,060	1,143,052
VWoA	15,997	18,977	43,966	48,068
TOTAL	**745,252**	**697,424**	**1,798,443**	**1,887,979**
Imported Car Sales	243,510	224,960	641,330	663,079
Imported Car Penetration	25%	24%	26%	28%

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '81	Year to Date '80
New Orders	Feb	$ 81.5	$ 81.3	$ 162.8	$ 158.4
Shipments	Feb	80.8	80.3	161.1	149.3
Inventories	Feb	166.1	164.9	331.0	310.5
Unfilled Orders	Feb	281.5	280.8	562.3	546.7
Manufacturers Value of Shipments*					
Primary Metals, Total	Feb	$ 12.4	$ 12.5	$ 24.9	$ 25.1
Steel	Feb	6.2	6.2	12.4	11.5
Nonferrous Metal	Feb	5.1	5.2	10.3	11.3
Nonelectrical Machinery Equip. Industries, Total	Feb	15.3	15.6	30.9	27.3
Engines & Turbines	Feb	1.2	1.4	2.6	2.3
Farm Machinery & Equip.	Feb	1.1	1.2	2.3	2.2
Construction, Mining & Materials Handling Equip.	Feb	2.8	2.8	5.6	5.2
Metalworking Machinery	Feb	.9	.9	1.8	1.8
General Industrial Machinery	Feb	1.2	1.2	2.4	2.4
Transportation Equipment Industry, Total	Feb	15.6	15.3	30.9	30.2
Motor Vehicle & Parts	Feb	9.3	9.1	18.4	19.0
Aircraft, Missiles & Parts	Feb	4.3	4.5	8.8	7.1
Shipbuilding & Military Tank Vehicles	Feb	.9	.8	1.7	1.6
Fluid Power Eqpt. (Index 1972 = 100)	Feb	214.5	214.5	—	—
Machine Tools**					
Net new orders	Feb	$ .3	$ .3	$ .6	$ .9
Shipments	Feb	.4	.4	.8	.7

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).
**Cutting and forming, domestic and foreign.

Sources: U.S. Dept. of Commerce, Individual Motor Vehicle Mfgrs., National Fluid Power Assn., NMTBA.

Chrysler's 1¼-ton (1.13-t) truck is powered by a 160 hp V-8 air-cooled KHD Deutz diesel that uses full-time four wheel drive with independent front suspension. It has a 2500 lb (1134 kg) payload.

Called the Expanded Mobility Truck (EMT), it was designed to meet the demands of worldwide terrains, including tropical, temperate and desert regions.

"We took it down to Baja to run it against some dune buggies," says a Chrysler spokesman, "and it ran circles around them. Some of our test drivers have run it up to 70 mph off the road."

The EMT gets 75% of its components from Chrysler's commercial light trucks. The vehicle could see commercial applications in the future, especially since this would help lower the delivery cost to the Army. (It will cost around $25,000 and could be serviced by Chrysler dealers worldwide.

Chrysler Defense's four-wheel-drive Expanded Mobility Truck uses a Deutz air-cooled V-8 diesel. It can do anything but leap tall buildings in a single bound!

"Our studies led to a design with excellent cross country approach and departure angles, and ground clearance to avoid off-road immobilizations," says Dr. Phillip Lett, vice president of engineering for Chrysler Defense. "The vehicle has oversize 14 by 18 in. tires and can cross 18 in. diameter logs, negotiate ditches, climb

steep hills, traverse mud, streams, sand, snow, vegetation, sharp ridges and severe rolling terrain."

Lett says the design meets all kinds of tactical applications including weapons carrier, troop carrier, reconnaissance vehicle or resupply vehicle.

According to Chrysler, its steady ride makes it applicable as an ambulance or carrier for delicate electronic equipment. The EMT is also supposed to accommodate the needs of mining operations, oil and power line maintenance, forest service and fire fighting. ■

INSIGHT ANALYSIS: WASHINGTON

The Import Imbroglio

by Paula Hodges, Washington Editor

Trying to have a calm conversation in Washington about Japanese auto restraints is about as easy as corking up a bottle of sour mash in a room full of alcoholics.

The issue may be second only to the Reagan budget proposals in sending politicians on both sides of the fence into apoplexy. But blood pressure is running high among the President's advisors and Cabinet as well.

The administration did present a united front in opposing legislation to impose a 1.6 million unit quota on Japanese auto imports cosponsored by Senate International Trade Subcommittee chairman John Danforth (R-MO).

The quota scheme is "inflexible" and could lead to Japanese retaliation against American products or demands for trade concession as compensation, officials say.

But in testimony before Danforth's subcommittee, Special Trade Representative William Brock was anything but united with Transportation and Commerce Secretaries Drew Lewis and Malcolm Baldridge who favor recommending a voluntary negotiated agreement to the President.

The three are members of the automotive task force charged with putting together a recovery package for the auto industry. Labor and Treasury Secretaries Ray Donovan and Donald Regan along with Chief Economic Advisor Murray Weidenbaum make up the rest of the team.

Brock did not endorse the idea of a negotiated agreement, saying he preferred to see how the President's economic plan helped the industry first.

However, he did maintain the President has the constitutional authority to negotiate, a position not held by the Carter administration.

Baldridge argued that it now appears likely that the industry will lose close to $500 million this year, imperiling its ability to finance modernization.

"But the cash flow picture is even worse," he warned. "The U.S. auto industry had a $9 billion cash flow deficit last year, and some current Wall Street estimates now indicate the industry will have a further cash flow deficit of $5 billion in 1981 and $3 billion in 1982."

Baldridge also stressed that Japanese import penetration reached 204,000 units in January.

Lewis backed Baldridge, saying, "It's very much to the advantage of the industry and to the country to have [voluntary] restraints, and that will be my position in the report."

They face a formidable array of opposition in addition to Brock. Task force members Regan and Weidenbaum, as well as Secretary of State Alexander Haig and Budget Director Dave Stockman, oppose any form of restraints.

Danforth, in commenting on the testimony, insisted that a quota or agreement is a critical part of a recovery package.

Sen. John Chaffee (R-RI) claimed Danforth's legislation "attempts to make a scapegoat of the Japanese auto industry." Instead, he blamed excessive wage settlements, failure to keep pace with productivity and marketing decisions for Detroit's plight.

"Import protection for American auto industry, in short, is robbing Peter to pay Paul. It would simply force a reshuffling of trade, and any increased profits for Detroit would come at the expense of other more efficient U.S. producers and their employees," Chaffee insisted.

In contrast, Sen. Carl Levin (D-MI), who appeared before the Subcommittee, contended that a 1.6 million quota was not low enough and recommended a 1 million limit for two to five years.

As the debate raged, both

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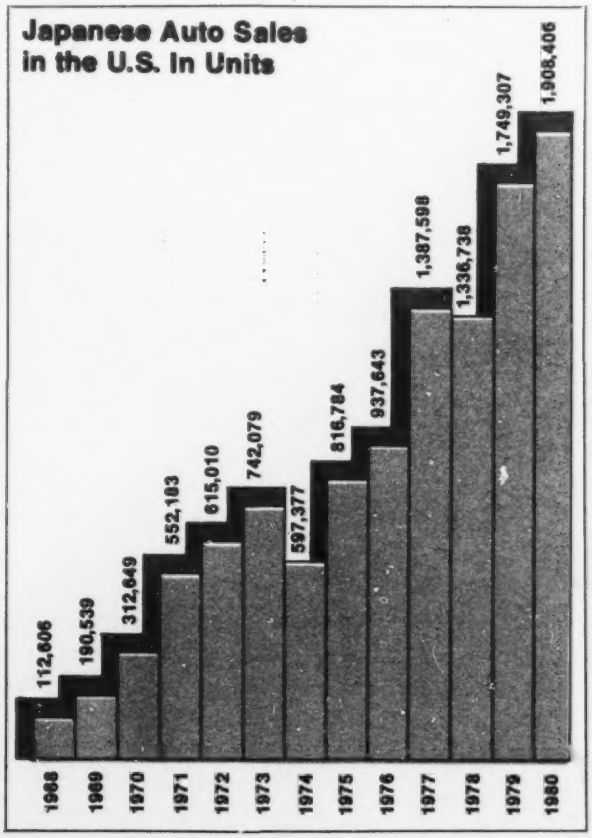

AI NEWS/ANALYSIS

Japanese Prime Minister Zenko Suzuki and his Trade Minister, Rokusuke Tanaka, called for a settlement before Suzuki visits Reagan this month. But neither official would shed any light on what Tokyo had in mind. ■

TALKING PERFORMANCE

Ford's Back In Racing

by John McElroy, Performance Editor

At last fall's 1981 model introductions, Ford Motor Co. president Don Petersen announced the formation of a new group called Special Vehicle Operations (SVO).

It seemed incredible that a company laying off thousands of employees and headed to record losses would create an additional layer of management.

Even more remarkable, SVO was formed to develop performance vehicles and lead the automaker back to the racing tracks that earned it so much glory in the 1960s.

"Our number one objective is to do something about Ford Motor Company's image," says German-born Michael Kranefuss, director of SVO. Kranefuss ran Ford's successful racing program in Europe.

"It's a very good indication to me that in a time when Detroit and especially the Ford Motor Company is going through the really bad times we're going through, our top management has the guts to create this organization," he says.

Kranefuss denies that this effort is merely an attempt to generate some quick profits through special edition automobiles.

"If that were the case," says Kranefuss, "there would have been quicker ways. We could have done a couple of aftermarket things—you know, look around to see what's available, and sell it and make some money. We've got to do something that speaks to our customers in a different way.

"SVO's primary goal will be to conceive, design and engineer a series of limited-production cars and trucks which will be marketed through Ford and Lincoln-Mercury dealers. These will not be one-of-a-kind show cars, but exciting versions of our mainstream production cars which will be sold by our dealers by the first quarter of 1982.

"These will not be purely cosmetic cars which overpromise, but fall short on intrinsic value. They will be simple, understated, honest cars that will incorporate the best of our worldwide technology."

The first of the specialty cars SVO will introduce will be limited-edition performance versions of the Mustang and Capri. The reason these cars have been chosen is that SVO will campaign a "ground-effects" Mustang powered by a 1.7-L (104-in.³) turbocharged 550 hp 4-cylinder engine in the IMSA GT series. The engine is based on the European Fiesta block. SVO wants to have a strong link identifying the

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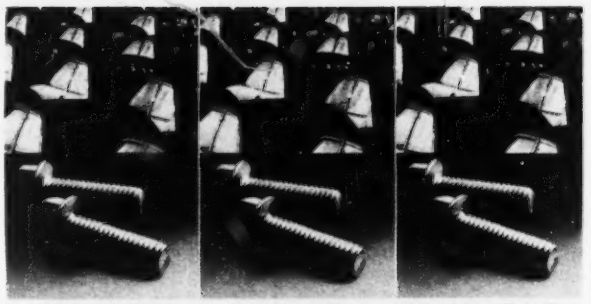
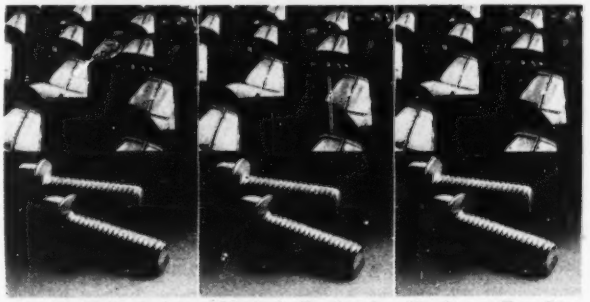
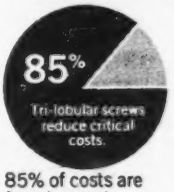


Fabrique en France | Made in USA | Deutsches Fabrikat



Svensk Tillverkning | Made in England | Hecho en España

TRANSLATION: LOWER IN-PLACE FASTENING COSTS



85% of costs are for labor and machine operations, inspection, downtime, tooling, equipment and overhead.

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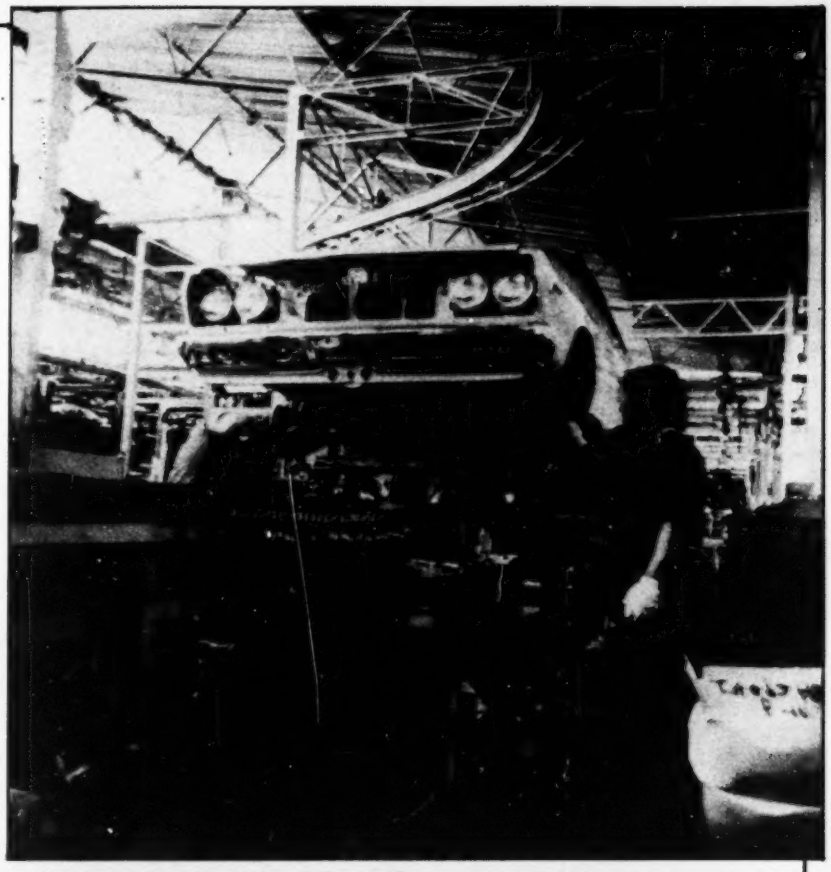

Nissan Motors is placing a lot of emphasis on Latin America. This plant in Mexico is likely to be expanded in the future.

Japan Seeks To Dominate Third World Markets

Seeing little growth left in U.S. and European markets, Japan is opening markets in developing nations. An early presence there may reap the most rewards when growth occurs.

by John R. Hartley

Sell to the limit in existing markets and dominate new ones. That's Japan's basic philosophy in regard to the automotive industry.

Officially, the Japanese do not expect to sell more cars in the U.S. and Europe this year than last. Takashi Ishihara, president of Nissan, estimates, "Exports to North America and Europe, which accounted for some 65% of Japan's car exports last year, are unlikely to grow this year beyond the 1980 levels." He says the only option in the future is to "join forces with other makers . . . through multiform linkups."

Nissan is looking to its proposed partnership with VW to give it more strength in the U.S. and Latin America, but it has also been the most aggressive Japanese company in setting up plants overseas. There is a truck plant in Tennessee, for example, the proposed plant in Britain, the purchase of 36% of Motor Iberica in Spain, and the deal to help Alfa Romeo add a model to its range.

But it was Honda that took the lead in setting up a plant in the U.S., while forging a link with BL for production of one model in Britain. These moves were considered essential to Honda's survival, quite simply because it exports a massive 70% of its output, and 86% of those exports go to North America and Europe.

Since Honda has a limited model range geared to conditions in advanced countries, it is intent on maintaining its existing markets. At the same time, it is now engaged in an ambitious program to increase sales in Japan by about 50%, so that exports will account for only 60% of sales.

So competitive is the Japanese market that such a plan seems impossible, especially since most of the manufacturers agree that future growth in Japan will be less than 2%, a figure also predicted for the U.S. and Europe.

Dedicated as they are to growth—Toyota's short-term plan is to increase output from 3.3 to 3.5 million units—the Japanese see the most potential in developing nations.

Teiichi Hara, executive managing director of Nissan Motors, says his company is putting emphasis on Mexico. "Their GNP is expected to rise by 8-10% over the next five years," Hara explains, "so we expect auto demand to increase strongly."

Nissan has a plant in Mexico producing Datsun 510s and trucks at a rate of 50,000 units annually. There is also an engine plant, which exports some engines back to Japan.

"We are building a new engine line in the Mexican plant, and we hope to be able to export some engines to the U.S.," Hara says. "We are starting to make replacement body panels for our worldwide requirements to help balance the export/import ratio."

In fact, Nissan already has capacity for some 300,000 units per year outside Japan, and its current plans will double this. But it continues to open up new markets, the most re-

Third World Markets

cent of which is in Chile. In the long term, Nissan expects Latin America and Africa to become very important markets.

Isao Nishina, Mitsubishi Motors' executive vice president responsible for exports, is more definite in his views. "Following trade friction, we are aiming to diversify from the U.S. and Europe to other countries," he explains. "Over the next five years, we see 1-2% growth in Japan and these major markets, but 10% per year elsewhere."

Mitsubishi is involved in more local assembly than its rivals. "Our average is 26.8%, against 16% for the Japanese industry, and our biggest plants are in Indonesia and Australia, where we bought Chrysler's operations. We have a five-year plan to increase output in Indonesia from 60,000 to 100,000 units."

Mitsubishi is also planning a plant in Indonesia to build engines at the rate of 70,000 units a year starting in 1984. It is to invest $1 million.

"Our overall policy is to increase the proportion of exports that are assembled locally to 40% over the next ten years," says Nishina. Mitsubishi has a major plan to open up new markets in the Middle East and Latin America, but is also putting emphasis on Southeast Asia.

Remarks Nishina, "We are exporting to South and West Africa, but Africa is not stable. It may be ten years before it is a large, stable market."

Toyota, which is still undecided about manufacturing in the U.S. or Europe, is also looking to Southeast Asia and the Middle East for growth. In fact, it has done very well in the Middle East already.

Notes Hideo Kamio, managing director responsible for export administration, "We don't expect any real change in the proportions of our exports going to different areas. It is true we have a plan to take 10% of the world's auto market, but that is more of an internal incentive.

"We expect some increase in sales in Southeast Asia, the Middle East and Latin America. The biggest growth will come from countries with oil or mineral resources, such as Indonesia, Malaysia and Singapore. For example, last year, sales in Indonesia reached 170,000 compared with 102,000 the year before. In Malaysia and Singapore, growth was around 30%."

Kamio admits that Toyota has no policy of increasing knockdown (KD) shipments. "This is done to meet governments' requirements," he points out, "so there is some natural growth. It is now about 20%." He adds that of the largest Toyota KD plants, neither Australia nor South Africa were profitable. "Only the plant in Indonesia showed a profit."

Do the Japanese see any major competition ahead? "Europe is the place where we shall face most competition from 'world cars' coming from American-owned companies," says Hara, citing the Escort and J-car. Toyo Kogyo agrees.

On the other hand, Mitsubishi expects to find more U.S.-built cars competing in Southeast Asia. "Logistically, Latin America should also be dominated by American cars," says Nishina, although he does not seem to think that it will be. Again, Toyota is more cautious.

"Despite all the talk, U.S. companies are very strong," notes Kamio. "We expect to face strong competition from them in Europe, Southeast Asia and Latin America. The Americans need big volumes to produce their cars economically, so they will think of other markets than North America." ■

N. America Gets Most Japanese Exports

	Estimated 1981 Production	Estimated 1981 Exports (%)	Percent Of Exports In 1980 By Areas						
			North America	Europe	Latin America	Africa	Middle East	Southeast Asia	Oceania
Toyota	3,300,000	1,700,000 (51.5%)	43.0%	18.0%	6.0%	5.7%	14.0%	9.0%	4.4%
Nissan (Datsun)	2,686,000	1,477,000 (55.0%)	44.8%	23.0%	5.4%	6.7%	10.7%	4.9%	4.5%
Toyo Kogyo (Mazda)	1,130,000	730,000 (65.0%)	38.0%	24.0%	4.0%	8.0%	8.0%	10.0%	8.0%
Mitsubishi	1,105,000	555,000 (50.0%)	31.0%	22.0%	6.1%	5.1%	3.4%	20.0%	12.0%
Honda	1,000,000	680,000 (68.0%)	64.0%	22.0%	1.8%	1.3%	2.1%	5.0%	3.3%
Total	9,221,000	5,142,000 (55.8%)							

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Europe's Component Makers
A ROUGH ROAD AHEAD

Large European suppliers are becoming world-class companies. But the small, national automotive supplier is in danger of becoming an anachronism.

Tin-plating pistons at Hepworth and Grandage (AE Group)

by Peter J. Mullins

While American automakers are desperately downsizing and retooling, European producers are agonizing over the problem of how to reposition, rationalize and reorganize the motor industry for the '80s.

The prospects are grim for Europe. Industry observers see Europe becoming a net importer of cars in the '80s. This scenario is particularly startling since the U.K. and West Germany have had a favorable balance of trade on motor products for at least a quarter of a century.

Especially vulnerable is the fragmented components industry. To put this into perspective, world vehicle manufacturing is divided basically into three blocks—Western Europe, the U.S. and Japan. Very roughly, each block makes a third of world output which amounts to about 30 million cars a year.

The really telling statistic, however, is that while the American Big Four are served by about 100 primary component suppliers, Europe's 14 major automakers rely on no less than 350.

Of these 350 major suppliers, a handful have already managed to convert themselves into world-class companies—GKN, Lucas, Bosch, ZF, Alfred Teves and Valeo (formerly Ferodo), for instance.

For the most part these big companies have big R&D budgets and are stepping up spending. A good example is Robert Bosch GmbH in Stuttgart. Gunther Baumann, director in charge of Bosch's automotive activities, told *AI* that his company has increased its research considerably in recent years.

"Research spending is particularly high in car electronics and engine management systems," Baumann noted. "We see a continuing swing to fuel injection. A modern system can save up to 17% on fuel compared to a typical carburetor."

Mid-sized component companies cannot match the resources of a Robert Bosch, although they are making a valiant effort. But the small companies which can't aspire to a world stance will really feel the crunch. These largely national suppliers are in danger of becoming anachronisms. Joint ventures among vehicle manufacturers may turn a collection of national motor industries with their own tight infrastructure of suppliers into one world industry.

Brian Knibb, London manager of AT Kearney and leader of the company's European Automotive Group, described a recent survey which reinforces this prospect. The survey gives a fascinating glimpse into how car builders see the future in sourcing.

Most say they will be sourcing

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STATE INVOLVEMENT

COUNTRY	COMPANY	OWNERSHIP (%)	1979 OUTPUT (000's) CARS	TRUCKS
France	Renault	100	1404	201
Germany	VW	40	1627	93
UK	BL	100	504	125
Italy	Alfa Romeo	100	208	2
Spain	Seat	54	295	5
Netherlands	Volvo BV	18	18	—
			4056	441
PROPORTION OF TOTAL EUROPEAN MANUFACTURE			36%	30%

Table showing degree of state involvement in motor industry in Europe (Source: AT Kearney)

more major parts in-house. In many cases, however, volumes will be limited and they will seek collaborative arrangements with other carmakers. A wider range of international purchases will be made "to exploit the most cost-effective sources."

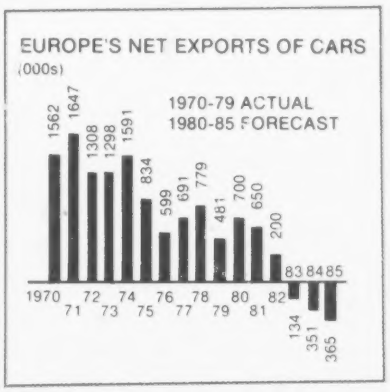
Many companies indicated they will be reducing their supplier list "to improve the management of supply lines and minimize problems associated with varying performance."

An exception to outside sourcing will be high-technology items. Carmakers will rely heavily on suitable suppliers for specialized, technically-advanced parts.

Automakers see themselves in the role of "encouraging and creating collaborative ventures between themselves and suppliers, as well as pressing suppliers to get together to combine skills or unite technology with management and financial strength." Quality and reliability of supply will be a "pre-eminent requirement."

It seems fairly obvious that the auto industry supplier of the future will be either a global supplier or a high-technology company making equipment like electronics, turbochargers or fuel injection systems. (It could, of course, be both.) But between these two extremes there exists what Tom Kovacs, senior consultant at AT Kearney, calls a "high risk area."

The writing is on the wall for small-to-medium companies supplying low-technology goods and/or services. These items are increasingly likely to be an in-house activity (including joint ventures) or be supplied from countries like Korea, Taiwan or Singapore.



Bar chart showing projected net export of passenger cars from Europe. According to this forecast, Europe will dip into deficit in 1982/3 (Source: Eurofinance)

The domestic motor industry of the past is now defunct. The far-sighted auto industry supplier must: upgrade his quality; upgrade his management efficiency; look for areas where he can collaborate with his customers or other components makers; and above all, look outside his country for business.

A prominent OEM executive summed it up well. "In the future," he said, "there will be a completely different approach to our suppliers. We will be ruthless on quality and reduce dramatically the number of our suppliers. Nevertheless, component makers have an important part to play if we, the European carmakers, are to stay in business." ■

Europe's Production Equipment Builders COMPUTERS AND ROBOTS LEAD THE WAY

European production equipment builders are developing flexible, computer controlled manufacturing systems for higher productivity.

by Peter J. Mullins

Robotics, microprocessors and minicomputers are leading the way to new concepts in production. The main goals are higher utilization of expensive facilities, better use of manpower and lower inventories.

The trend is to mixtures of special and digitally-programmed machines. New types of transfer lines enable families of parts to be processed on common production lines. Model changes can be accommodated without vast re-equipment costs.

Such flexible lines are becoming particularly popular in Europe where batch sizes tend to be relatively small. A typical example is the Sofim plant at Foggia in Southern Italy. Here Renault, Fiat and Alfa Romeo have a joint venture making small, high-speed diesel engines for cars and light trucks.

The majority of the machining lines at Sofim have been designed and supplied by Comau of Turin and include individual lines for machining seven different types of cylinder blocks, six different types of cylinder heads, two kinds of connecting rods and bearing caps, and five types of flywheels.

In another instance Comau has installed a highly flexible system for machining various parts for trucks and construction equipment for Iv-

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Autoworkers in the U.S. and Germany are protesting the import of Japanese cars into their countries. In the U.S. United Auto Workers Local 588 of the Ford Motor Co. Chicago Stamping plant wield sledgehammers and bats on a 1975 Toyota Corolla. The autoworkers want a Fair Trade Laws amendment.

It's Not Impossible, But... SELLING IN JAPAN

by John R. Hartley

U.S.-built cars can be sold in Japan, but many changes are needed if the sales volume is to be worthwhile.

With its massive downsizing program, Detroit has the chance to increase exports substantially. But what about exports to Japan? The difficulties of selling in Japan are far greater than those needed to take sales from imports on U.S. soil.

Last year, about 10,000 U.S.-built cars were sold in Japan, down from 16,000 the year before. The slump in sales was in line with that for Japanese-built cars in the over 2.0-L (122-in.^{3}) class.

At present, only those Japanese people wanting a large and ostentatious car buy American. Those in search of something exotic buy a European car, while the vast majority buy Japanese—for centuries the virtues of buying Japanese products have been ingrained into the Japanese people.

Current trade friction is likely to lead to a gradual change in this atmosphere. The U.S. auto industry will be able to take advantage of this change as long as it changes the product to suit the Japanese market.

As a result of the energy crisis, Japanese are buying more smaller cars, yet the top end of the market for cars of 1.8- to 2.8-L (110- to 170-in.^{3}) is holding up well. Market switches in models have been subtle. For example, the Datsun 910 has increased sales, but the Datsun Laurel and Toyota Cressida, two slightly bigger cars, have lost sales badly. Small hatchbacks of around 1.3-L (80-in.^{3}) are increasing sales in a dwindling market.

In the foreseeable future, American cars are likely to sell because they offer something different, and because they look different. The opportunities are for cars in the 1.8- to 2.8-L class and for specialties, such as Ford's new Escort-based coupes (Ford EXP and Mercury LN7).

Although sales of American cars were down last year, Buick and Chevrolet bucked the trend, thanks to the X-cars. Ford should do likewise this year with the Escort, but the volumes will still be peanuts, simply because no effort has been made to adapt the car to Japan.

What is needed? First, since the Japanese drive on the left, like the British, right-hand-drive is essential. The Escort is still left-hand-drive as is the Chrysler K-car.

Second, some models should fit into the under 2.0-L class, which means that apart from engine size, the wheelbase should be no more than 2700 mm (106 in.) and width no more than 1700 mm (67 in.)

Equipment levels need to take into account trends in Japan. For example, the interior of the Escort looks cramped to the Japanese because of its massive fascia, while the interior of the K-car looks about ten years out of date. To Japanese eyes, the paint and door fits don't look good either.

What is needed are cars that look a bit different outside, have right-hand-drive, a high standard of finish and reasonable performance. The interior needs to be light and airy, but a few gimmicky controls and instruments will go down well. And there must be quite a few options.

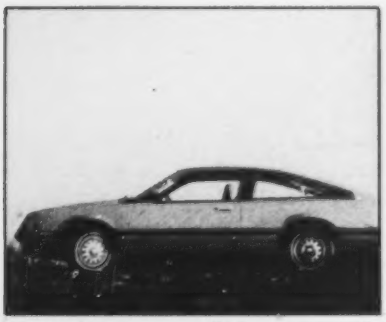
Once the product is right, the price must be reduced from current levels. For example, a new Ford Escort costs $13,000 in Japan, and the K-car costs $19,000. Yet VW is able to sell its 1.7-L (105-in.^{3}) Golf two-door (Rabbit) for only $9200. A Fiat Ritmo (Strada) costs $10,000-13,000, and Alfasud $13,000, and the Volvo 244 GT $19,000—and all these European models are available with right-hand-drive.

Clearly, unless the U.S.-built cars costs less than their European counterparts, there is little chance

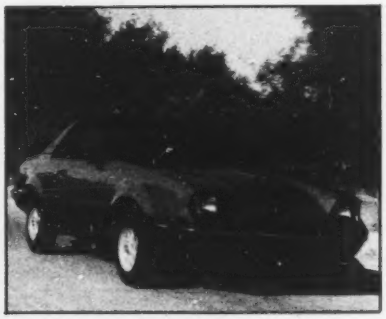
At a carnival in Mainz, W. Germany, a float depicts a Japanese "tiger" ready to pounce on German carmakers. The automakers are shown hearing, seeing and saying nothing. The float's motto is: "Listen what's coming from outside."

1980 Import Volumes into Japan	
VW/Audi	17,805
GM—U.S.	5,874
(Buick 2,281)	
(Chevrolet 2,233)	
(Cadillac 805)	
(Pontiac 555)	
Ford—U.S.	4,443
Mercedes-Benz	3,887
BMW	3,187
BL	3,132
Volvo	1,243
Chrysler—U.S.	329
Total imports	44,871

Total imports of cars into Japan in 1980 were 44,871 units, representing 1.57% of the passenger car market.



Most U.S. cars sell for extremely high prices in Japan—too high to be competitive. But, specialty cars such as GM's J-car coupes can stand the higher prices with sales possible in realistic volumes.



Ford's new EXP has a good chance of selling well in Japan, but U.S. automakers must invest in their own dealerships in major cities, with a properly financed backup system.

of reasonable sales volumes.

Currently, the VW Golf is the biggest selling import in Japan, at about 14,000 units a year. But compared with Japanese cars, its price is ridiculous. For example, a Mazda GLC or Honda Civic 1500 three-door costs about $4300—less than half the price of the Golf. To be competitive, the Escort needs to be priced under $9000.

If that situation looks gloomy, there is some sunshine when it comes to specialty cars such as the new Ford EXP and the forthcoming GM J-car coupes. The GM P-car also looks like it could sell well in Japan.

In other words, as long as the cars look distinctive, and are specialty models that can stand a higher price, then sales are possible in realistic volumes.

Current dealer networks are also inadequate. Mitsubishi does sell the Chrysler Horizon, but its salesmen are distinctly unenthusiastic. Both Ford and GM have small networks. But they must invest in their own dealerships in major cities, with a properly financed back-up system.

It is true that in 1974 Ford established its own company in Japan for this purpose. But it never really established a large enough network, nor a large enough model range.

Clearly, for the dealers to want to sell, they need a reasonable range to get sufficient volume. In theory, Ford has such a range, with the Fiesta and Cortina from Europe, and the Capri/Mustang from the U.S. Unfortunately, the Fiesta in Japan comes with a 1.6-L (98-in.^{3}) engine, whereas it would do better with the 1.1- or 1.3-L (67- or 80-in.^{3}) units.

The point is that it is just as important to devise a suitable model range for Japan as it is for the U.S.

What about hidden "non-tariff barriers"? Certainly they exist. It is time that the Japanese brought many of their minor regulations into line with American and European standards. It is also time that individual officers responsible for inspecting imported cars were no longer permitted to interpret the law according to their whims.

Two notable cases of this "interpretation" concerned lettering. Peugeot changed the form of the letter 'J' on the rear of some cars from a J to a J, and the officials refused to register the cars. Jaguars were refused approval because the typeface for the letter 'L' in the chassis number had been changed.

In detail, Japan's import procedures are unfair, even if the book says they are fair. But until the prices of U.S.-built cars are halfway competitive, and there is a dealer network of reasonable size, these non-tariff barriers are a vexation rather than a real barrier. ■

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S R For Auto Industry

1981 SUPPLIERS ISSUE

OEM FINANCIAL ANALYSIS & SOURCE GUIDE

AUTOMOTIVE INDUSTRIES

June, 1981/Volume 161, Number 6

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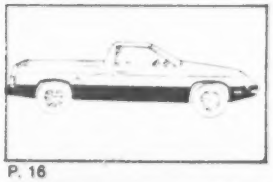
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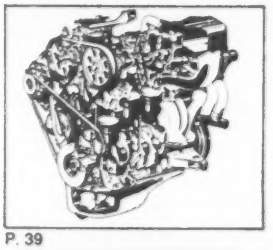
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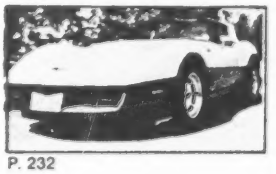
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COVER

The keys to the automotive OEM industry—supplier financial analysis, source guide and company profiles—are all within the pages of this month's issue.

NEXT MONTH

AI July looks at the newest, efficient recreational vehicles, the unusual world of specialty vehicles and computer aided design and manufacturing.

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Key Indicators

U.S. New Car Sales — Units — Year to Date

	April '81	April '80	1981	1980
AMC	11,957	15,981	34,380	67,323
Chrysler	83,540	49,947	275,810	218,969
Ford	142,077	125,216	467,350	473,529
GMC	394,574	363,455	1,360,119	1,532,737
VWoA	17,579	21,215	65,320	68,838
TOTAL	**649,727**	**575,814**	**2,202,979**	**2,361,396**
Imported Car Sales	216,410	201,581	841,051	862,628
Imported Car Penetration	25.0%	25.9%	27.6%	26.8%

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '81	Year to Date '80
New Orders	March	$ 84.6	$ 82.2	$ 247.4	$ 240.6
Shipments	March	82.4	81.1	243.5	230.4
Inventories	March	166.7	166.3	—	—
Unfilled Orders	March	284.1	281.9	—	—
Manufacturers Value of Shipments*					
Primary Metals, Total	March	$ 11.8	$ 12.5	$ 36.9	$ 37.6
Steel	March	5.8	6.2	18.2	17.7
Nonferrous Metal	March	4.8	5.1	15.1	16.4
Nonelectrical Machinery Equip. Industries, Total	March	15.6	15.2	46.5	42.5
Engines & Turbines	March	1.2	1.2	3.8	3.5
Farm Machinery & Equip.	March	1.2	1.1	3.5	3.3
Construction, Mining & Materials Handling Equip.	March	2.7	2.8	8.3	8.0
Metalworking Machinery	March	.9	1.0	2.7	2.8
General Industrial Machinery	March	1.3	1.2	3.7	3.6
Transportation Equipment Industry, Total	March	17.0	15.5	47.9	45.7
Motor Vehicle & Parts	March	10.1	9.3	28.5	28.3
Aircraft, Missiles & Parts	March	5.2	4.3	14.0	11.4
Shipbuilding & Military Tank Vehicles	March	.9	.8	2.6	2.4
Fluid Power Eqpt. (Index 1972 = 100)	March	215.0	214.5	—	—
Machine Tools**					
Net new orders	March	$ .4	$ .3	$ .9	$ 1.5
Shipments	March	.5	.4	1.3	1.2

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).

**Cutting and forming, domestic and foreign.

Sources: U.S. Dept. of Commerce, Individual Motor Vehicle Mfgrs., National Fluid Power Assn., NMTBA.

constant." Chrysler is counting on the whole U.S. market expanding to 9.6 million this year, 10.6 million in 1982, 11.4 million in 1983 and 11.6 million in 1984. ■

Olds To Offer 'Clean' V-6 Diesel

by John A. Stark

GM's Oldsmobile Div. apparently is tooling up to manufacture a new 4.3-L (261-in.³) V-6 diesel engine for its front-wheel-drive A-cars in 1982.

Automotive Industries has learned that Olds currently is retooling at a site in Lansing, MI to produce six-cylinder diesels which will pass tough California engine emissions standards with flying colors.

Olds reportedly will manufacture the new 80-hp V-6 diesel with the same machine tool lines which it uses for the current V-8 diesel powerplant. Hence, block design will be identical, minus two cylinders.

Olds supposedly will follow its sister Chevrolet Div. by about six months in using advanced engine timing technology. Chevy developed this automatic diesel timing technique for its 6.2-L (380-in.³) V-8 truck diesel.

It's expected this Chevy-pioneered timing procedure will enable Olds diesels to meet stringent California emissions regulations easily next year. In addition, it'll eliminate the need for particulate traps on the new V-6 diesel. ■

Blue Mack Offers High MPG

by Michael K. McCann

Get ready for Big Blue. Mack Truck has switched to the color blue for its new diesel engine series called Econodyne. Mack claims Econodyne can compete on equal fuel economy and durability terms with any other engine series.

The Econodyne series features ten full and reduced speed configurations. There are seven in-line six-cylinder units producing 250 to 350 hp, and three V-8s ranging from 400 to 440 hp.

Mack's Walter M. May, executive vice president of product and engineering, explains that all Econodyne engines come equipped with advanced turbocharging systems and charge air-cooling. The chassis mounted cooling con-

6th ANNUAL SUPPLIERS' FINANCIAL ANALYSIS

by Ira G. Black and Cathy Bretherick

Okay, 1980 was a stinker. Not much question there. And 1981 is not exactly burning up the sheets. But it's getting better—definitely better.

If things improve enough in the second half, or even last quarter it could turn out to be a halfway decent year. While that's a mighty big "if," it seems like most suppliers are expecting great things from '82.

It's an ill wind that doesn't offer at least *something* on the positive side. And for 1980 and '81 it seems to be this:

Managers have been forced to pay closer attention to every dollar. Running lean has become the rallying cry. Many are going all out to boost productivity. Fixed costs are under intense scrutiny, as are considerations regarding what is now generally accepted as a world automotive market.

This latter is important on a couple of counts. First, it holds the promise of increased volume which means fixed costs can, naturally, be spread over more units. Second, it signals the emergence of even more U.S. manufacturers out of blind provincialism and into the light of the world economy.

Parts & Components

For parts and component suppliers especially, how well they did last year is largely reflected in how closely they were tied to the domestic industry and to which end of the vehicle scale—large cars or small. In 1980 it also helped to be a diversified manufacturer.

It's important to look at some of these companies to get a clear focus on what was certainly a mostly dismal picture.

A prime example is Rockwell International. Although overall sales and earnings were up 12% and 7% respectively over 1979, a decrease of 5.6% in sales in Rockwell's automotive division interrupted eight years of continuous earnings growth. The division's net earnings of $92.5 million last year were drastically lower than fiscal 1979's $212 million.

Like Rockwell, Eaton Corp.'s performance in 1980 mirrored the turndown. Sales of transportation products were $1.41 billion with earnings at $156 million. This is a substantial decline from 1979's totals of $1.66 billion sales and $247 million in earnings. Transportation products represent 44% of company sales, down 5% from 1979 and down 17% from five years ago. These businesses, however, provided 59% of Eaton's operating profit last year.

The Timken Co., though not quite as vulnerable because of a more diversified market, nevertheless suffered its first significant fall in unit volume since 1970—the result of weakened demand. Reported earnings for 1980 slipped nearly 10% from 1979.

For TRW, 1980 sales in its car and truck segment totaled $1.75 billion, a 3% decrease from 1979. Operating profit showed a 22% decrease from a year ago. About 50% of TRW car and truck sales are to OEMs outside North America, while 24% are within. Like Timken,

SELECTED PARTS & COMPONENTS SUPPLIERS

Average % Return on Sales = 3.96

Company	'80 Net Sales ($ millions)	'80 Net Earnings (% millions)	% Return On Sales
ITT	18,529.7	894.3	4.8
Rockwell Int.	6,906.5	280.2	4.1
TRW	4,983.9	211.9	4.3
Bendix	4,270.4	191.6	4.5
Textron	3,637.5	86.1	2.4
Eaton	3,176.5	115.8	3.6
Borg-Warner	2,673.3	126.1	4.7
Dana	2,524.0	95.7	3.8
Colt Ind.	2,165.6	97.8	4.5
Cummins	1,666.5	(10.9)	—
Timken	1,338.5	92.6	6.9

TRW benefited from the diversity created by these overseas markets.

Truck parts is the largest of the three management groups in Dana Corp. Sales here were reduced by about half in 1980, ending a nine-year streak of record profits. Dana closed four plants during its 1980 fiscal year, but says reduced dependence on the truck market and increased involvement in service, industrial and international business should greatly aid the situation.

Steel

Integrated domestic steel producers took a drubbing in 1980 as production and shipments both took a steep slide.

While 1979 saw shipments of about 101 million tons, 1980 witnessed a dismal 84 million tons—a 17% falloff. It could have been worse. Only a dramatic and last-minute rebound in the fourth quarter prevented it.

Some industry watchers say '81 should see a modest rebound for steel. But that it will probably *not* be the result of any greatly significant tonnage increases. Rather, it will hinge on further cost-cuttings and even more diversification by the big integrated producers.

There is talk of a continued slump in some quarters; others are more optimistic, citing a much-hoped-for pickup in car sales, energy-related industries, possible inventory building and better depreciation schedules.

Despite all the waffling, though, the best-case long-term outlook for American steelmakers is amazingly bright. Should a capital goods "boom" develop, and should an expected continuation of strength in oil country spending hold, shipments could approach 1973's record tonnage figures of 111 million tons by mid-decade.

Machine Tools

Compared with 1979, the machine tool industry in 1980 took a tumble for two reasons.

First, durable goods producers cut back on capital spending because they had more capacity than they knew what to do with. Second, the cost of money remained high enough to scare almost anyone off.

So, the industry suffered a 15% drop in orders. Add inflation's effects and you get a total drop in real orders of about 25%. In fact, in the last quarter of 1980 metalcutting orders took an almost-30% plunge from the year earlier levels.

But before you start sending letters of condolence, be advised that the major tool builders have enough backlog to keep them humming for many months to come. In January it stood at just over $5 billion.

Add to that the expected sharp increases in defense and aerospace spending and you have a pretty rosy long-term picture. High-tech builders, such as those who make robots and numerically controlled tools, will undoubtedly benefit the most if such spending gets moving in a big way.

The best news lately came this past March when, after five months of decline, orders rose 27% for the month. This upturn followed a March 11 announcement by a handful of congressional leaders that any depreciation reform legislation would be retroactive.

The National Machine Tool Builders' Assn. (NMTBA) cautioned, though, that this jump was nevertheless 34% below March 1980 and that the first quarter total of $909 million was 39% below last year's first quarter total. The association also noted that a one-month rise "does not establish a trend."

Over the longer term, some domestic machine tool builders are shooting glances over their shoulders as overseas builders come a'hounding hard on their heels. Foreign makers tend to tout shorter delivery times, lower prices and increased willingness to work with their customers. The upshot is that in 1980, foreign-built machine tools could claim almost a quarter of the U.S. tool consumption. A decade ago it was less than 10%.

Plastics

When it comes to plastics sup-

SHIPMENTS & ORDERS FOR MACHINE TOOLS

Date		Shipments	Net New Orders
1975	Total	$2,451,700	$1,186,350
1976	Total	2,059,600	2,230,000
1977	Total	2,280,750	2,996,900
1978	Total	3,013,450	4,344,000
1979	Total	3,876,550	5,542,700
1980	Total	4,691,750	4,661,700

Source: NMTBA — Figures in thousands (000)

SELECTED STEEL SUPPLIERS

Average % Return on Sales = 2.56

Company	'80 Net Sales ($ millions)	'80 Net Earnings ($ millions)	% Return On Sales	% Return On Equity
U.S Steel	12,492.1	504.5	4.0	9.5
LTV	8,010.0	127.9	1.6	15.6
Bethlehem Steel	6,743.0	121.0	1.8	4.7
Armco Inc.	5,678.0	265.3	4.7	13.6
National Steel	3,900.0	83.8	2.3	6.0
Republic Steel	3,760.0	50.9	1.4	3.4
Inland Steel	3,255.4	29.7	.9	2.3
Allegheny Ludlum	1,524.3	45.9	3.0	12.8
Wheeling-Pittsburgh	1,100.1	14.8	1.3	3.5
Sharon Steel	829.8	11.8	4.6	9.5

SUPPLIERS' FINANCIAL ANALYSIS

pliers it's a little hard to tell exactly what's what.

While 1980 shipments in many cases were off, selling prices were generally up, buoyed (or pushed) by more expensive labor, materials, energy and transportation. This meant a higher dollar sales increase. But profits slipped.

And then you have accounting procedures. Such things as currency translation, capitalization rules, inventory accounting methods, write-offs, acquisitions, foreign tax finagling, tax-loss carryforwards and others make it difficult to determine whether a given company made or lost money. In one case a company reported nearly a 20% gain in earnings. But the gain was solely the result of changes in accounting procedures.

Decontrol of oil prices isn't a particularly pleasant prospect for plastics, as it was controlled prices that gave U.S. producers an edge in '80 over their overseas counterparts.

So, with the decontrol of U.S. oil, coupled with a general business slowdown in both Europe and Japan, domestic chemical companies can expect some falloff of overseas business this year.

Look for chemical companies to step up the pace in adding value to their goods, i.e., stepped up offering of products rather than only basic materials.

Aluminum

Last year was one the aluminum companies certainly will remember with fondness.

Several of them reported record profits—the result of two things, primarily. One was an aggressive pricing policy put in place to help defuse rapidly rising costs. The other was strong foreign demand. This latter, however, now gives every indication of falling out of bed completely this year. Which means aluminum will have to look elsewhere.

Fortunately there are some signs pointing to better days ahead in both the construction and auto markets—both figuring importantly for aluminum and both hurting due to costly money.

Aluminum users may be able to breathe a bit easier in the coming year. Primary aluminum prices, which soared a whopping 38% over two years, are expected to moderate—good news for automotive as aluminum use in vehicles continues to proceed apace.

Rubber

Last year these pages made note of the fact that the tire industry had lost a lot of its bounce—which was an understatement as '79 oozed into '80. It was all part of a seven-year profit decline which, insiders say, should reverse itself by 1982-84.

Happily that reversal seems to have begun a bit sooner than expected. Overcapacity had been the big problem here. But as soon as the industry got rid of it, the door was open for a relatively rapid rebound in both prices and profits. Too, most of the companies have done yeoman duty in whacking back overhead and operating costs as well.

Look for things to improve even more over the next two to three years ■

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SELECTED NONFERROUS METAL SUPPLIERS

Average % Return on Sales = 9.59

Company	'80 Net Sales ($ millions)	'80 Net Earnings ($ millions)	% Return On Sales
Alcan	5,264.0	542.0	10.2
Alcoa	5,147.6	469.9	9.1
Reynolds	3,653.0	180.3	10.0
Kaiser	3,222.1	527.6	7.7
Inco	3,036.1	219.4	7.2
Amax	2,949.0	470.0	15.9
Martin Marietta	2,619.3	230.2	7.0

SELECTED TIRE & RUBBER SUPPLIERS

Average % Return On Sales = 1.08

Company	'80 Net Sales ($ millions)	'80 Net Earnings ($ millions)	% Return On Sales
Goodyear	8,444.0	230.7	2.7
Firestone	4,850.5	(122.0)	(2.2)
Goodrich	3,079.6	61.7	2.0
Uniroyal	2,299.5	(7.8)	—
General Tire	2,215.2	40.8	1.8

SELECTED PLASTICS SUPPLIERS

Average % Return On Sales = 4.52

Company	'80 Net Sales ($ millions)	'80 Net Earnings ($ millions)	% Return On Sales
DuPont	13,652.0	716.0	5.3
Union Carbide	9,994.0	673.0	6.7
Celanese	3,348.0	122.0	3.6
Hercules	2,485.2	114.0	4.6
Owens-Corning-Fiberglas	2,285.1	54.3	2.4

SUPPLIERS' FINANCIAL ANALYSIS

COMPANY	SUPPLIER OF:	'80 NET SALES ($ millions)	'80 NET EARNINGS ($ millions)	% CHANGE OVER '79 +(−)	1980-1979 EARNINGS/ SHARE	% RETURN ON SALES	% RETURN ON EQUITY
Acme-Cleveland	PE	405.2	17.2	(12.2)	4.02-4.38	11.7	15.2
Airco, Inc.	MS	1.0	.45	(0.6)	NA	4.5	7.3
Air Products & Chemicals, Inc.	P+C	1,420.0	115.5	18.0	4.07-3.45	8.1	17.4
Alcan Aluminum Ltd.	P+C	5,264.0	542.0	21.0	6.70-5.28	10.2	NA
Alcoa	P+C, M	5,147.6	469.9	(6.8)	6.54-7.15	9.13	17.3
Allegheny Ludlum	M	1,524.3	45.9	(35.8)	4.11-7.30	3.0	12.8
Allen Group Inc.	P+C	348.5	8.8	(13.0)	2.03-2.44	2.5	11.3
Allied Chemical Corp.	P+C, M	5,519.0	289.0	100.0	8.15-0.20	5.2	16.8
Allis-Chalmers	P+C	2,063.9	48.2	(40.8)	3.60-6.23	2.3	7.2
Amax Inc.	MS	2,949.0	470.0	22.2	7.48-6.49	15.9	22.1
American Motors Corp.	M	2,552.6	(197.5)	NA	(6.00)-2.76	NA	NA
Amp Inc.	P+C, PE	1,155.8	131.3	8.0	3.65-3.36	11.4	22.7
Armco Inc.	M	5,678.0	265.3	6.3	4.73-4.51	4.7	13.6
Armstrong Rubber Co.	P+C	401.3	(16.4)	NA	(10.17)-4.39	NA	NA
Armstrong World Industries, Inc.	MS	1,322.9	48.6	(26.0)	1.94-2.58	3.7	8.6
Asarco Inc.	M	1,817.0	237.3	(8.4)	8.02-8.56	13.1	18.1
Asea/NC	M, PE	2,900.0	89.2	12.0	2.55-2.15	NA	NA
Athlone Industries	MS	282.7	10.4	68.3	3.66-1.14	8.4	18.9
Atlantic Richfield Co.	M	24,155.6	1,651.4	42.0	6.64-4.74	6.8	24.36
Avery International	MS	619.0	24.5	16.1	2.72-2.35	4.0	15.1
Bandag, Inc.	P+C	330.9	27.3	8.3	2.27-1.99	8.3	18.0
Barber-Greene	MS	226.5	4.7	(37.3)	2.05-3.30	2.1	7.3
Barnes Group, Inc.	MS	433.9	24.3	(3.8)	3.51-3.68	5.6	18.4
Beatrice Foods	MS	8,290.5	290.1	10.0	2.81-2.60	3.5	14.5
Beckman Instruments, Inc.	PE	549.3	36.6	25.0	1.83-1.66	6.7	15.9
Bendix Corp.	MS	4,270.4	191.6	15.1	7.68-7.10	4.5	14.3
Bethlehem Steel Corp.	M, MS	6,743.0	121.0	(56.0)	2.77-6.31	1.8	4.7
Black & Decker	PE	1,438.3	90.1	(5.0)	2.14-2.25	6.3	16.6
Bliss & Laughlin Steel	MS	256.6	18.5	4.7	2.55-2.41	7.2	16.9
Boise Cascade	M	3,018.9	148.8	(14.9)	5.58-6.52	4.9	11.6
Borg-Warner	P+C	2,673.3	126.1	(19.0)	5.85-7.25	4.7	10.9
Briggs & Stratton Corp.	P+C	708.6	49.1	1.3	3.39-3.35	6.9	21.0
Bucyrus-Erie	MS	511.3	48.2	(14.2)	2.36-2.75	9.4	12.4
Bundy Corp.	MS	153.6	.23	(97.0)	.06-2.05	.1	.4
Burgess-Norton Mfg. Co.	P+C, MS	914.9	71.2	12.0	6.60-5.88	7.8	23.2
Carpenter Tech. Corp.	MS	559.1	43.1	5.6	5.03-4.76-	7.7	17.3
Caterpillar Tractor Co.	P+C	8,597.8	564.8	(13.0)	6.53-5.69	6.6	16.5
Celanese Corp.	M	3,348.0	122.0	(13.0)	3.50-3.10	3.6	12.1
Champion Spark Plug Co.	P+C	799.8	36.9	(35.1)	.96-1.49	4.6	9.1
Cherry Electrical Products Corp.	P+C	88.0	7.5	20.1	1.67-1.47	8.5	19.5
Chicago Pneumatic Tool Co.	PE, MS	474.1	11.9	(28.0)	2.44-3.30	2.5	7.1
Chrysler Corp.	MS	9,225.3	(1,709.7)	NA	(26.00)-(17.18)	NA	NA
Cincinnati Milacron Inc.	PE	816.4	75.6	36.0	3.35-2.47	9.3	26.6
Clark Equipment Co.	O	1,533.7	53.5	(49.6)	4.18-8.03	3.5	8.6
Coachmen Industries Inc.	MS	125.3	(7.6)	25.6	(2.09)-(2.81)	(6.1)	(23.0)
Colt Ind.	P+C	2,165.6	97.8	(12.2)	7.38-8.40	4.5	14.4
Conoco Inc.	O	18,325.4	1,026.2	20.5	9.52-7.58	5.6	22.4
Consolidated Freightways Inc.	P+C	1,653.6	9.8	(85.0)	1.38-1.25	.6	2.9
Copperweld Corp.	P+C, M	460.7	18.9	(18.0)	3.33-4.04	4.0	12.0
Cross & Trecker	PE	355.4	33.4	27.0	2.70-2.15	9.4	24.0

Abbreviations:
Supplier of: M indicates a material supplier. MS indicates a multi-supplier. P+C indicates a parts and components supplier. PE designates a production equipment supplier. The designation O simply means other. NA indicates information was not available. Earnings per share are quoted on a primary basis for nearly all companies.

SUPPLIERS' FINANCIAL ANALYSIS

COMPANY	SUPPLIER OF:	'80 NET SALES ($ millions)	'80 NET EARNINGS ($ millions)	% CHANGE OVER '79 +(−)	1980-1979 EARNINGS/ SHARE	% RETURN ON SALES	% RETURN ON EQUITY
CTS Corp.	P+C	187.9	10.3	(6.0)	2.33-2.40	5.5	9.7
Cummins Engine Co., Inc.	P+C	1,666.5	(10.9)	N/A	(1.31)-6.84	N/A	N/A
Cyclops Corp.	M	978.9	20.4	74.0	6.14-1.35	2.1	11.5
Dana Corp.	P+C	2,524.0	95.7	(41.7)	2.78-5.03	3.8	9.9
Data General Corp.	MS	853.9	54.7	10.0	5.20-4.82	8.4	21.7
Data Instruments Inc.	P+C	11.0	NA	NA	NA	NA	NA
Dayco	P+C	716.4	8.6	(59.2)	1.51-3.87	1.2	5.9
Deere & Co.	P+C	5,469.8	228.3	(26.5)	3.72-5.12	4.2	10.7
Diamond Shamrock	M	3,143.0	201.2	11.5	3.66-3.37	8.4	16.2
Digital Equipment Corp.	M	2,368.0	250.0	40.0	5.45-4.10	17.3	18.0
Dow Corning	M	681.5	73.9	3.4	NA	10.8	19.6
Donaldson Co., Inc.	P+C	234.4	8.2	(42.0)	1.60-2.78	3.5	10.6
Dow Chemical	M	10,626.0	805.0	2.6	4.42-4.33	7.6	18.1
Dresser Industries, Inc.	MS	4,016.3	261.1	12.7	3.35-2.94	6.5	15.8
DuPont Co., Inc.	MS	13,652.0	716.0	(24.0)	4.83-6.42	5.3	13.4
Dynascan Corp.	O	51.2	1.9	256.0	.56- .16	3.7	7.0
Eagle-Picher Industries, Inc.	P+C, MS	543.0	21.0	(30.0)	2.14-3.03	3.9	10.3
Eastman Kodak Co.	MS	9,734.3	1,153.6	15.0	7.15-6.20	11.9	20.2
Eaton Corp.	P+C	3,176.5	115.8	(24.4)	4.35-5.86	3.6	11.9
Elco Industries, Inc.	P+C	81.1	2.1	(45.0)	1.70-3.15	2.6	7.2
Emhart Corp.	MS	1,302.9	67.0	19.9	5.47-4.38	3.7	15.5
Esmark	MS	6,108.4	471.8	510.8	21.90-4.40	7.7	81.4
Ethyl Corp.	P+C	1,741.0	89.7	(8.0)	4.39-4.77	5.2	13.2
Evans Products Co.	P+C	1,462.9	41.4	(33.7)	2.96-4.65	2.8	NA
Ex-Cell-O Corp.	P+C	1,020.7	50.4	(7.0)	4.91-5.31	4.9	13.1
Exxon Corp.	O	103,142.8	5,650.1	24.0	12.99-9.74	5.5	22.2
Federal-Mogul Corp.	P+C, PE	721.2	36.7	(13.0)	2.88-3.31	5.1	14.8
Ferro Corp.	M	695.6	29.0	(6.1)	3.77-4.07	4.2	12.9
Firestone Tire & Rubber Co.	MS	4,850.0	(122.0)	NA	(1.84)-1.96	(2.2)	(7.5)
FMC Chain Division	P+C	3,482.0	142.7	(6.0)	4.26-4.55	4.1	11.9
Ford Motor Co.	MS	24,347.6	(1,543.3)	NA	(12.83)-9.75	NA	NA
Fruehauf Corp.	P+C	2,081.7	32.2	(64.0)	2.63-7.28	1.5	6.1
H. B. Fuller Co.	MS	296.7	9.7	31.0	2.16-1.65	3.3	16.2
Funk Mfg.	P+C	1,800.0	146.7	31.0	4.04-3.56	8.0	18.8
GAF Corp.	MS	1,230.6	(233.5)	NA	(17.57)-1.83	NA	NA
Gates Rubber Co.	P+C, MS	600.0	NA	NA	NA	NA	NA
General Electric	MS	24,959.0	1,514.0	6.9	6.65-6.20	6.1	18.5
General Motors Corp.	MS	34,581.0	(762.5)	NA	(2.65)-10.04	NA	NA
General Signal	P+C	1,521.7	104.2	18.7	4.01-3.52	6.9	16.8
General Tire & Rubber	MS	2,215.2	40.8	(50.1)	1.68-3.37	1.8	4.1
Genuine Parts Co.	P+C	1,431.7	67.8	10.0	2.46-2.24	4.7	21.2
Getty Oil Co.	O	10,150.4	871.9	30.7	10.60-7.34	8.6	21.0
Giddings & Lewis, Inc.	PE	327.0	31.4	8.0	4.89-4.71	9.6	26.8
Gleason Works	PE	242.6	16.3	(16.8)	3.26-3.91	6.7	NA
B.F. Goodrich	MS	3,079.6	61.7	7.5	3.57-4.89	2.0	6.5
Goodyear Tire & Rubber Co.	P+C	8,444.0	230.7	58.0	3.18-2.02	2.7	10.0
W. R. Grace & Co.	M	6,101.3	283.8	24.0	6.08-5.01	4.7	16.8
Gulf & Western Ind.	MS	5,782.8	255.3	10.9	4.38-3.70	4.4	15.3
Gulf Oil	O	26,483.0	1,407.0	6.0	7.21-6.78	5.3	14.6
Harsco	M	1,063.2	49.7	(4.2)	4.94-5.27	4.7	13.8

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SUPPLIERS' FINANCIAL ANALYSIS

COMPANY	SUPPLIER OF:	'80 NET SALES ($ millions)	'80 NET EARNINGS ($ millions)	% CHANGE OVER '79 +(−)	1980-1979 EARNINGS/ SHARE	% RETURN ON SALES	% RETURN ON EQUITY
Hayes-Albion Corp.	P+C	184.4	(.003)	NA	(.77)-.06	NA	NA
Hyster Co.	PE	683.3	63.1	0	10.48-9.38	9.2	23.0
Hercules, Inc.	P+C	2,485.2	114.0	(16.5)	2.60-3.89	4.6	11.7
Hewlett-Packard Co.	P+C, MS	3,099.0	269.0	24.5	4.47-3.43	8.7	17.4
Honeywell	PE	4,924.7	293.5	11.2	13.13-11.89	6.0	15.4
Hoover Universal	P+C	578.7	16.8	(46.7)	1.90-3.57	2.9	11.0
IC Industries	MS	4,141.6	120.7	11.9	6.02-9.52	2.9	9.4
Imerman Industries, Inc.	PE	10.0	.7	1,000.0	NA	7.0	700.0
Inco Ltd.	P+C, M	3,036.1	219.4	55.0	2.56-1.58	7.2	12.1
Inland Steel	M	3,255.4	29.7	(77.0)	1.38-6.18	.9	2.3
Instron Corp.	PE	58.5	2.9	(34.1)	2.86-4.31	4.9	13.9
Interlake, Inc.	M	1,055.9	13.8	(65.2)	2.29-6.66	1.3	4.2
International Business Machines	PE	26,213.0	3,562.0	15.5	6.10-5.16	13.6	21.6
International Harvester	P+C	6,311.8	(397.3)	NA	(12.02)-12.01	NA	NA
International Packings Corp.	P+C	47.6	1.5	(5.9)	7.38-10.06	3.1	9.3
InterNorth Inc.	M	3,037.8	211.7	12.4	4.70-4.09	7.0	18.0
ISSC Inc.	PE	33.2	1.9	231	1.29-.82	5.6	NA
ITT Corp.	MS	18,529.7	894.3	57.4	6.12-2.65	4.8	14.3
ITW	P+C	401.6	44.3	7.0	3.62-3.37	11.0	16.9
Johnson Controls, Inc.	P+C	964.9	34.0	(25.0)	2.43-3.29	4.0	11.0
Jones & Laughlin Steel	M	8,009.9	127.9	(26.0)	3.95-6.03	1.6	16.4
Joy Mfg. Co.	PE, MS	934.3	59.7	20.0	4.58-3.82	6.4	14.5
Kaiser Aluminum & Chemical	M	3,222.1	247.6	6.2	5.91-5.66	7.7	17.5
Keene Corp.	P+C, M	210.0	37.9	25.0	4.22-3.52	5.7	17.5
Kennecott Copper	M	2,255.8	192.4	32.2	5.79-3.93	8.5	12.5
Keystone Consolidated	P+C	396.1	(3.5)	NA	(1.84)-.40	(.9)	(3.1)
Lamson & Sessions	P+C	235.0	(15.5)	NA	(2.95)-3.03	NA	NA
Lear Siegler, Inc.	P+C	1,423.4	65.7	3.7	4.23-4.50	4.6	18.7
Libbey-Owens-Ford	O	1,159.9	28.8	(50.4)	2.17-4.80	2.5	5.7
Lindberg Corp.	P+C	64.2	4.6	(19.5)	1.32-1.65	7.2	19.0
Litton Industries	MS	4,246.5	290.8	35.0	7.42-4.77	6.8	24.9
Loctite Corp.	MS	199.3	25.9	11.0	2.65-2.40	13.0	25.0
LTV Corp.	M	8,010.0	127.9	(26.0)	2.96-4.27	1.6	15.6
Lukens Steel Co.	M	375.9	4.7	(37.3)	.90-1.44	1.3	3.5
3M Co.	MS	6,080.0	678.0	3.5	5.78-5.59	11.2	21.7
Marathon Oil Co.	MS	8,180.0	379.0	17.3	6.27-5.34	4.4	21.0
Medalist Industries, Inc.	P+C	143.2	2.4	1.0	1.05-2.35	1.7	7.0
Midland Ross Corp.	P+C	908.4	43.8	7.0	3.70-3.51	4.8	15.6
Mobile Corp.	O	59,510.0	3,272.0	38.7	15.40-9.46	5.5	25.0
Modine Mfg. Co.	P+C	200.9	10.5	(27.0)	3.64-5.00	5.2	15.0
Mohawk Rubber Co.	P+C, M	180.7	4.7	59.6	3.94-1.62	2.6	11.9
National-Standard Co.	MS	NA	5.3	(59.0)	1.29-3.14	1.7	4.8
National Steel Corp.	M	3,900.0	83.8	(33.0)	4.42-6.56	2.3	6.0
NL Industries, Inc.	M	2,117.6	167.7	50.0	4.94-3.28	15.1	20.0
Nordson Corp.	PE	149.1	13.6	5.5	2.58-2.50	9.0	25.0
Northwest Industries	MS	2,876.4	155.4	(9.8)	5.03-5.60	5.4	16.2
Olin Corp.	M	1,778.1	71.2	11.8	2.97-2.62	4.0	9.6
Owens-Corning Fiberglas Corp.	M	2,285.1	54.3	(50.3)	1.78-3.59	2.4	21.7
Parker-Hannifin Corp.	MS	1,022.4	55.9	5.2	3.80-3.64	5.5	17.6
Pennwalt Corp.	MS	1,189.0	43.0	(13.4)	4.20-5.01	3.6	11.0

Abbreviations:
Supplier of: M indicates a material supplier. MS indicates a multi-supplier. P+C indicates a parts and components supplier. PE designates a production equipment supplier. The designation O simply means other. NA indicates information was not

SUPPLIERS' FINANCIAL ANALYSIS

COMPANY	SUPPLIER OF:	'80 NET SALES ($ millions)	'80 NET EARNINGS ($ millions)	% CHANGE OVER '79 +(−)	1980-1979 EARNINGS/ SHARE	% RETURN ON SALES	% RETURN ON EQUITY
Pennzoil Co.	M	2,483.0	308.5	22.7	5.90-4.69	12.4	30.2
Phillips Petroleum Co.	M	13,376.6	1,069.6	16.7	7.01-5.77	8.0	21.7
H.K. Porter Co.	P+C	654.9	11.9	(50.2)	9.88-20.03	1.8	8.1
PPG Industries, Inc.	M	3,158.4	209.2	(4.4)	6.34-6.78	6.6	14.7
Raybestos-Manhattan, Inc.	MS	274.4	(6.3)	(182.6)	(2.70)-2.24	(2.3)	(6.7)
Raytheon Co.	P+C	5,002.1	282.3	30.1	6.80-6.30	5.6	21.7
Republic Parts Inc.	P+C	78.9	2.4	4.0	1.11-1.06	3.0	10.3
Republic Steel Corp.	M	3,760.0	50.9	(58.0)	3.15-7.49	1.4	3.4
Revere Copper & Brass Inc.	M	748.1	21.9	(14.8)	3.82-4.50	2.9	12.8
Rexnord, Inc.	P+C	1,083.7	41.6	(27.0)	2.09-2.91	3.8	10.7
Reynolds Metals Co.	P+C, M	3,653.2	180.3	2.0	9.32-9.25	10.0	14.0
Robertshaw Controls Co.	P+C	340.0	10.2	(9.0)	2.66-2.86	2.9	9.2
Rockwell International Corp.	P+C	6,906.5	280.2	7.0	3.77-3.66	4.1	17.1
A. Schulman, Inc.	M	288.8	7.1	4.7	3.25-3.10	2.5	15.7
Sealed Power Corp.	P+C	257.8	11.8	(44.0)	2.45-4.35	4.6	9.5
Sharon Steel Corp.	M	829.8	3.3	(94.4)	.04-.71	0.4	1.4
Shell Oil Co.	M	19,830.0	1,542.0	27.0	4.99-3.66	7.8	19.0
Sheller-Globe Corp.	P+C	450.2	(20.0)	NA	(3.59)-1.84	NA	NA
Signal Cos., Inc.	MS	4,285.3	167.7	(17.7)	2.89-3.52	3.9	12.8
Signode Corp.	PE	695.5	38.6	(11.9)	4.86-5.56	5.5	12.4
A. O. Smith Corp.	P+C	693.7	(1.7)	NA	(.35)-4.79	NA	NA
Snap-On Tools Corp.	PE	401.8	38.3	(10.0)	1.92-2.16	9.5	21.5
Sperry Vickers	PE	525.0	NA	NA	NA	NA	NA
SPS Technologies	P+C, PE	341.1	21.8	17.4	4.56-3.90	6.4	22.0
Square D Co.	PE	998.9	83.0	(36.6)	3.41-3.04	8.3	20.3
Standard Oil (CA)	O	40,479.0	2,401.0	25.7	7.02-5.22	5.9	21.7
Standard Oil (IN)	O	26,133.1	1,915.3	21.3	6.54-5.12	7.3	20.4
Standard Products Co.	MS	213.6	(2.7)	(293.0)	(2.26)-4.37	(1.3)	NA
Standun Inc.	P+C	32.1	3.1	32.3	2.47-1.66	9.7	26.1
Subaru of America, Inc.	MS	744.2	17.7	41.2	2.95-1.74	2.4	NA
Sun Co.	O	12,945.0	723.0	3.2	5.92-5.89	5.6	16.8
Sun Electric Corp.	PE	203.3	11.6	2.7	2.02-2.32	5.7	19.8
Tektronix, Inc.	PE	971.3	85.1	10.3	4.66-4.28	8.8	19.2
Teledyne	MS	2,926.4	343.8	(7.6)	22.85-22.07	11.7	24.5
Tenneco Inc.	P+C	13,226.0	726.0	21.3	5.95-5.30	5.5	17.4
Texaco Inc.	O	51,195.8	2,642.5	33.4	9.79-6.48	5.2	21.1
Texas Instruments, Inc.	MS	4,074.7	212.2	18.5	9.22-7.58	5.2	18.2
Texasgulf Inc.	M	1,090.1	325.6	58.0	9.70-4.05	29.9	32.0
Textron	MS	3,637.5	86.1	(71.5)	2.30-4.51	2.4	7.5
Thiokol Corp.	P+C	675.0	32.4	(19.3)	2.80-3.47	4.8	15.0
Timken Co.	M, P+C	1,338.5	77.9	(9.3)	8.26-9.14	6.9	12.6
Townsend	P+C	3,376.7	169.4	3.0	4.52-4.39	5.0	14.7
TRW, Inc.	P+C	4,983.9	211.9	9.0	5.69-5.28	4.3	17.4
Union Carbide Corp.	MS	9,994.0	673.0	21.0	10.08-8.42	6.7	15.3
Uniroyal	MS	2,299.5	(7.8)	NA	(.30)-(4.54)	NA	NA
Upjohn Co.	M	1,760.6	170.4	12.3	5.71-5.03	9.7	19.7
U. S. Steel Corp.	M	12,492.1	504.5	NA	5.77-(3.41)	4.0	9.5
Wallace Murray Corp.	P+C	577.5	33.6	(5.4)	5.02-5.29	5.8	16.0
Westinghouse	P+C	8,514.3	402.9	NA	4.71-(.87)	4.7	15.9
Wheeling-Pittsburgh	M	1,100.1	14.8	(70.2)	2.85-12.16	1.3	3.5
Witco Chemical Corp.	M	1,175.7	40.9	(4.0)	4.50-4.83	3.5	15.4
Wyman-Gordon Co.	P+C	550.2	29.9	31.1	3.30-2.28	5.4	17.4

Abbreviations:
Supplier of: M indicates a material supplier. MS indicates a multi-supplier. P+C indicates a parts and components supplier. PE designates a production equipment supplier. The designation O simply means other. NA indicates information was not available. Earnings per share are quoted on a primary basis for nearly all companies.

AUTOMOTIVE INDUSTRIES

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AUTOMOTIVE INDUSTRIES

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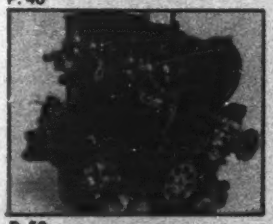
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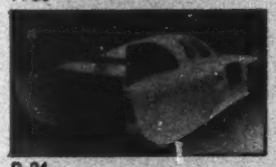
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Key Indicators

U.S. New Car Production — Units

	May '81	May '80	Year to Date 1981	Year to Date 1980
AMC	9,348	10,290	43,728	77,613
Chrysler	58,791	45,594	334,601	264,563
Ford	122,343	116,548	589,693	590,077
GMC	314,764	310,074	1,674,883	1,842,811
VWoA	14,475	14,455	79,795	53,293
TOTAL	**519,721**	**496,961**	**2,722,700**	**828,356**
Imported Car Sales	208,878	191,625	1,065,216	1,057,362
Imported Car Penetration	28.7%	27.8%	28.1%	27.2%

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '81	Year to Date '80
New Orders	April	$ 83.9	$ 84.2	$ 335.1	$ 315.6
Shipments	April	82.8	82.1	325.9	304.7
Inventories	April	167.9	166.8	—	—
Unfilled Orders	April	285.2	284.1	—	—
Manufacturers Value of Shipments*					
Primary Metals, Total	April	$ 11.9	$ 11.8	$ 49.9	$ 50.6
Steel	April	6.2	5.8	25.4	23.7
Nonferrous Metal	April	4.6	4.8	20.0	22.3
Nonelectrical Machinery Equip. Industries, Total	April	15.5	15.5	62.5	56.4
Engines & Turbines	April	1.3	1.2	5.3	4.6
Farm Machinery & Equip.	April	1.2	1.1	5.1	4.5
Construction, Mining & Materials Handling Equip.	April	2.7	2.7	11.2	11.3
Metalworking Machinery	April	1.0	.9	3.9	3.6
General Industrial Machinery	April	1.3	1.3	4.9	4.8
Transportation Equipment Industry, Total	April	17.4	16.9	66.6	61.4
Motor Vehicle & Parts	April	10.6	10.0	40.7	37.7
Aircraft, Missiles & Parts	April	4.9	5.1	18.6	15.9
Shipbuilding & Military Tank Vehicles	April	.9	.9	3.3	3.3
Fluid Power Eqpt. (Index 1972 = 100)	April	216.4	215.0	—	—
Machine Tools**					
Net new orders	April	$ .3	$ .4	$ 1.2	$ 1.9
Shipments	April	.4	.5	1.7	1.5

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).
**Cutting and forming, domestic and foreign.

Sources: U.S. Dept. of Commerce, Individual Motor Vehicle Mfgrs. National Fluid Power Assn. NMTBA.

doesn't react when a car suddenly cuts in front because there is no closing speed.

An impressive feature of Rashid's brake is that the distance between the radar car and one ahead is automatically kept proportional to the vehicle's speed and the road conditions.

Noting that the system reacts equally to metal, wood or concrete objects, Charles Rashid said, "It can measure density and size of an object, as well as discriminate between the two. We work with 'good signals'—it will not 'see' an empty box, but fill the box up and the unit will stop the car.

"We set the unit to stop for pedestrians or anything that will damage the car. If a bird flew in front of the car, the unit would ignore it. The unit will also ignore debris on the highway."

"The most recent computer we had to put in," Rashid said, "was a device for filtering out noise from other radar and electronic sources. Some day we may have thousands of these units on the same frequencies 'looking' at each other.

"We've now made this system so sophisticated that when it transmits its beam and strikes an object, our receiver knows exactly when the beam should return to the computer. Anything that arrives sooner or later won't produce a reaction."

A simple but vital feature of the Rashid system is that it doesn't begin operating after a stop until the car reaches ten miles an hour.

The Rashids have also built 58 prototypes of their radar brake, installed them on cars and tested them under different road and atmospheric conditions in most sections of the country. They've also been tested in environments ranging from minus −40%C (−43°F) to 200°C (390°F). Charles Rashid insists there have been no significant problems. ■

ASEA Sets Up Robot Division

by Peter J. Mullins

ASEA, the Swedish electrical giant, has set up a new division for developing, manufacturing and marketing industrial robots and robot systems.

The intention is "to strengthen the organization in one of ASEA's most ex-

Productivity Explosion

CAD/CAM COMES OF AGE

Top suppliers of computer aided design and computer aided manufacturing are growing 60-100% per year. The totally automated factory may be only a few years away.

Designing a component with a CAD/CAM system, such as this engine, allows an engineer to evaluate a host of alternatives very quickly.

by John McElroy

The age of computer aided design and computer aided manufacturing (CAD/CAM) is at hand. According to the Anderson Report, a CAD/CAM newsletter, the top six suppliers of CAD/CAM hardware and software are growing at a rate of 60% to 100% per year and some of the smaller firms are growing at 200% per year.

Total sales in 1981 are expected to top $800 million and hit $2 billion by 1984. Even so, Anderson estimates that only 7% of the potential market has been reached, indicating the surface has barely been scratched.

A Delphi study of engineers conducted by the University of Michigan and the Society of Manufacturing Engineers (SME) backs these projections. It indicates that 25% of all manufacturing industries in the U.S. will rely on CAD/CAM by 1990.

The simple reason for this ex-

CAD/CAM

traordinary growth is that CAD/CAM offers tremendous productivity improvements. "Productivity gains of two-to-one are typical in new designs, meaning you can design a part in half the time it used to take," says Neil Jefferies of the Center of Manufacturing Technology, a non-profit consulting firm. "Four-to-one gains are common in design changes. The computer simply allows you to work faster."

The heart of any CAD/CAM system is the CRT (cathode ray tube), a TV screen that allows an engineer to produce a blueprint without ever lifting a pencil.

The engineer "draws" on the CRT with an input device. This can be a light-pen, which looks just like a pen with a wire connecting it to the CRT, or he can type in the information on a keyboard. There are other input devices as well, including voice command.

Once the designer gets his basic outline on the CRT he can instantly rotate it to view from any angle, stretch it, change the scale or add depth to produce a 3-D version. Recent software developments permit the use of color, shading and solid geometric forms.

The engineer can also call up reference drawings that have been preprogrammed into the system's memory and incorporate them into the emerging design. If he wants to redesign just a corner or section, he merely has to fit the redesigned piece into the overall drawing. This eliminates redoing the entire design.

Mistakes can be detected instantly and corrections made immediately. And at the touch of a button he can have the system's printer produce a hard-copy version of the design that he can take to his boss.

"CAD/CAM is now considered to be the conventional process by our product designers and process engineers," says Frank Stoneking, head of manufacturing development at GM. "By using computer assists we are producing major panels, such as fenders, that are not only more dimensionally accurate, but are being designed and engineered in half the time required by previous manual techniques.

"The first real test of this technology occurred in 1974 when the oil embargo was under way," Stoneking explains. "The decision was made to resize the 1977 full-size cars then being designed. This change meant we would be nine months behind schedule and would have to undergo a major shift in specifications. Our CAD/CAM system enabled us to generate smaller, lighter and more fuel-efficient vehicles and still get them out on time."

"One of the ways not to make errors is to avoid that translation of data as it goes from the design to manufacturing and tooling," says Ralph Schubert, vice president of Computervision, the largest CAD/CAM supplier.

"One of the most important developments in this area is in the area of analytics," Schubert says. "It gives you the ability to take an engineering design and to do the analysis of that design before it is transferred over to the manufacturing side of the house, to verify all of the design criteria. Finite element modeling, stress analysis and thermal analysis are going to be the areas of biggest growth."

In the auto industry the use of finite element modeling and stress analysis has been particularly helpful in refining body and chassis designs to provide minimum weight with maximum strength. Noise, vibration and hardness (NVH) control has been dramatically improved through computer aided engineering. The result is a quality of ride in most of today's small, front-wheel-drive cars that would have been unheard of as little as five years ago.

The use of CAD/CAM for engine mapping allows the design engineer to simulate engine performance, in which different designs can be evaluated over different driving cycles. The computer predicts emissions and fuel economy and the engineer picks the best design.

The most exciting development of late has come in connecting CAD with CAM, also known as closing

A Bendix Corp. setup shows computer simulation of a transfer line on a CRT.

Computers are becoming more common in an industrial environment to help plan in production scheduling, inventory management and shop floor control. (Photo courtesy Formation Inc.)

the loop. With new sophisticated hardware and software the engineer not only creates a design, he also produces the instructions needed to manufacture it on computer controlled machines.

"By closing the loop with our system," says Bob Ronnigen of Ronnigen Research & Development, a development firm in Vicksburgh, MI, "we can cut design time from ten or twenty weeks down to one week.

"One of our engineers or customers might come in with a concept drawn on an envelope or napkin," Ronnigen explains. "We take that to one of our consoles and start with a dot in the middle of the screen and design around that dot to create the final drawing. Then, off the screen, we run a simulated tool around the part.

"With some of the features we've added to the software it knows the feeds, speeds and cutter sizes it's going to need to make that part. Then it automatically produces an NC tape of DNC instructions that we take out to our shop to make the part."

Designing and manufacturing car components on computers sounds fairly amazing, but CAD/CAM goes well beyond that. The hardware and software now exist not only to design a transfer line, an assembly line or an entire factory, but also to simulate how they will work in production.

"Simulation is an attempt to reproduce in the lab or under test conditions, phenomenon which may occur in the real world," explains Steve Parsley of the Harnischfeger Corp., a crane manufacturer. "It doesn't predict what the best design is, but it indicates which of the different possibilities a designer may choose works better than another."

Simulation is used to verify a design by identifying potential bottlenecks, and to evaluate "what-if" alternatives. Since computers add speed and accuracy, more alternatives can be evaluated. And with the high cost of capital investment, it can help management determine which equipment is absolutely necessary. Simulation can even be used to train employees on how the overall system works and how their actions affect it.

"I feel no new factories should be built or changes made to old ones without first using computer simulation," states Dr. Janice Church of the Illinois Institute's Technological Research Institute (IITRI).

"In the auto industry the accounting people did their homework first and used computers before the manufacturing people did," she continues. "But that is beginning to change. GM and Chrysler are probably ahead of others in computer simulation although we've also worked with Citroen, Fiat and Volvo.

"Chrysler and GM have time sharing programs with which the plant people can call in and analyze a change without having to describe it to someone else or wait around for a computer to become available."

"We think that computer simulation is not only a desirable tool, it's the only way to go," agrees Robert Caulfield, manager of machine and equipment development at GM. "One division [Pontiac] used simulation for a new engine plant and paid for the system because they found both excess and inadequate capacity for their original proposals. It paid for the system even though this was the first time we did an entire plant using computer simulation."

"We used computer simulation for our K-car plants in Newark and Jefferson Avenue," adds Dave Long, manager of technical systems development at Chrysler. "On a transaxle machining line, for example, it can indicate where to locate banks for non-synchronous stations.

"It's possible to simulate what will happen if there is a tool breakage or a parts shortage. Based on these parameters the process and tool engineers can judge which setup is best. We feel that we have the potential to double up-time.

"So for a 10% to 15% increase in money spent up front for this type of operation, you can get a large increase in productivity."

Simulation isn't limited to large scale designs either. Bendix is using CAD/CAM and simulation in the design of machine tools. "With CAD/CAM our customers will be able to supply their part geometry and machine specifications to us via the telephone line," says Thomas Henderson, manager of graphic systems at Bendix Machine Tool Corp.

"There are three primary benefits for the customer," Henderson says. "First, the customer can see how the machine will perform before it is built, allowing the builder/customer team to consider up-time alternatives. Second, errors in layout and placement are readily apparent. And third, tool change strategies can be developed and viewed to ensure proper procedures in advance rather than trial and error after the machine is built or delivered."

Computers have been used the longest and most successfully by in-

dustry in the area of machine tool control. The increases in productivity have been substantial. "But the machines are still manually fed and the computers don't schedule the process that feeds them. Computer aided manufacturing will change that," predicts Peter Link, vice president and general manager of CAM-I, a non-profit joint industry research project.

"With CAM, managers will be able to monitor production on a continuous basis. They'll know if they can meet their daily goals as the process is running, or predict what they must do to meet those goals.

"There will be an explosion of computers on the factory floor that will allow the process engineer and operator to communicate and bring management closer to the floor. We'll learn to manage resources like we never have before. It'll make everyone their own manufacturing center and will make jobs more interesting because it will minimize idle time."

Integrated Computer Aided Manufacturing (ICAM) is a program sponsored by the U.S. Air Force designed to produce a totally automated factory in the future. Although many people think they're way off base, the Air Force has already demonstrated several key features of the program and expects to have an ICAM factory operating by 1990.

Bendix has let it be known that it may have an automated factory in place for one of its divisions before 1985.

"ICAM is the application of scientific methodology for the improvement of productivity in manufacturing," explains Dennis Wisnosky of International Harvester. Wisnosky used to head the ICAM program for the Air Force until he was ferreted away by IH. "Because of the computers and software now available, it's possible to use ICAM.

"Traditionally, factory management views every activity as an entity unto itself. For example, by looking at individual operations you can end up with machining centers that actually run too fast—they may produce pieces faster than they can be used at the end of the line.

"ICAM looks at the entire process and plans production on a total system basis. You may even have to slow down or detune some operations. In this system, for example, a robot is part of a network that performs an operation determined by a computer at a higher mode of operation.

"Most companies band-aid everything, they operate on a piece-meal basis. Very few companies have a five year plan for integrating operations on a total system basis. It'll be 10 years before we have an ICAM factory, but by the mid-'80s we'll have parts of it in place.

"It's going to take some risk taking, and it won't generate short term profits, but it will increase quality and productivity immediately." ■

Top 10 CAD/CAM Firms

FIRMS	Number of Systems in Service (Software and Hardware)
Computervision	800
Applicon	500
Calma	450
Autotrol	200
Intergraph (M&S)	150
MCSI	80
Gerber	80
Unigraphics	70
CADAM	50
Calcomp	13

Source: Center for Manufacturing Technology as of Jan. 1981.

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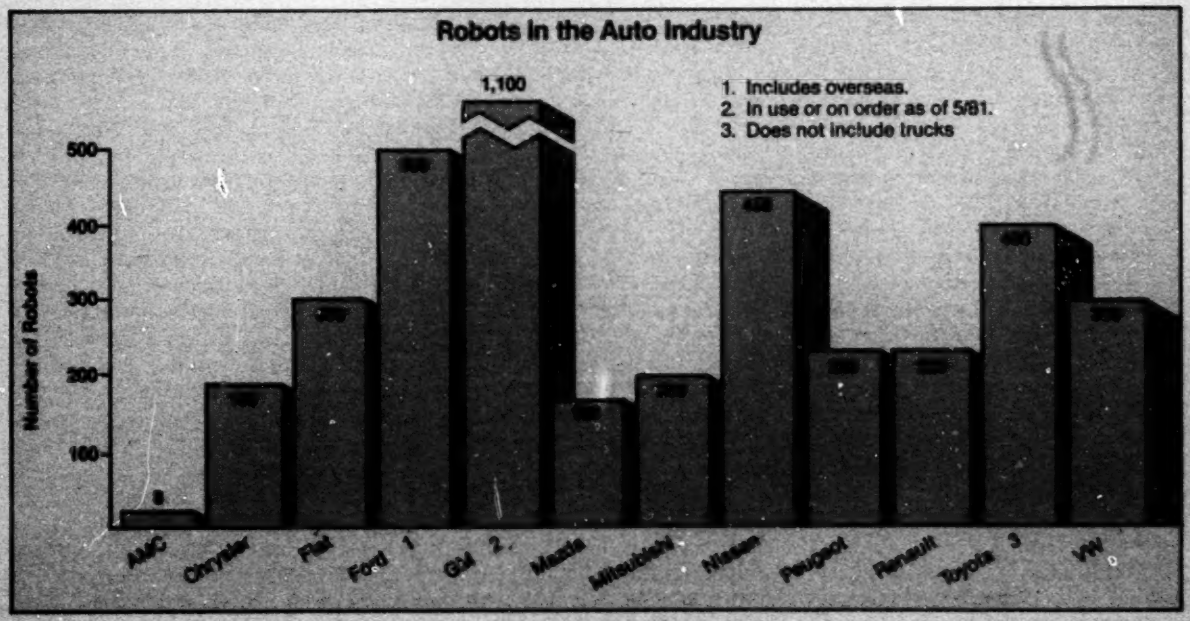

Robotics, a part of computer aided manufacturing, is an area of tremendous growth in the auto industry. By this time next year this chart will be obsolete—the figures may well double.

Chilton's
AUGUST 1981

AUTOMOTIVE INDUSTRIES

SIZING UP

Ford's New Compact Pickup

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Chilton's
AUTOMOTIVE INDUSTRIES

August 1981/Volume 161, Number 8

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This five year chronology follows 1000 Ford employees and $700 million of the company's money in the development of the new compact Ranger.

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Sometimes traditional metalworking processes are just too rough.

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A firsthand look at the Mexican automotive industry shows prosperity and growth despite problems.

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One connector in place of many can cut through wiring headaches.

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Worldwide organization is Bendix's answer to competitive pressures.

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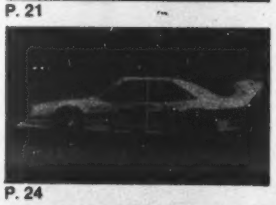
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COVER

Henry Potoczak, Ford light truck engineer, and his crew see how the new compact Ranger measures up to the Courier and F-100.

NEXT MONTH

Get set for the Great Materials Shoot Out in September as *AI* looks at the fight for automotive attention among steel, aluminum and plastics.

abc

AUTOMOTIVE INDUSTRIES (ISSN 0005-1527) magazine is published monthly by Chilton Co., Chilton Way, Radnor, PA 19089. Chilton Co. is a division of American Broadcasting Companies Inc., New York, NY. Subscription prices: United States and U.S. Possessions—$25.00 per year, $45.00 for 2 years; Canada and Foreign—$35.00 per year. Air rates on request. Single copies and back issues on request. All subscription orders must be accompanied by cash or check, along with complete information for classification, including the title of the individual and the product the company manufactures. 2nd class postage paid at Philadelphia, PA 19104 and additional mailing offices. POSTMASTER: Send address changes to AUTOMOTIVE INDUSTRIES, P.O. Box 2055, Radnor, PA 19089.

Key Indicators

U.S. New Car Production — Units

	June '81	June '80	Year to Date 1981	Year to Date 1980
AMC	12,458	13,527	45,995	73,493
Chrysler	83,784	39,680	434,410	327,986
Ford	149,930	108,553	782,170	688,875
GMC	447,597	351,163	2,221,338	2,201,322
VWoA	12,392	18,639	94,209	105,459
TOTAL	**706,161**	**531,542**	**3,558,122**	**3,397,135**
Imported Car Sales	205,824	190,424	1,271,040	1,251,905
Imported Car Penetration	22.6%	26.4%	26.3%	26.9%

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '81	Year to Date '80
New Orders	May	$ 84.1	$ 84.3	$420.3	$383.2
Shipments	May	82.9	82.6	410.9	375.7
Inventories	May	168.6	168.0	—	—
Unfilled Orders	May	286.9	285.8	—	—
Manufacturers Value of Shipments*					
Primary Metals, Total	May	$ 11.7	$ 11.9	$ 62.4	$ 61.6
Steel	May	6.1	6.3	31.9	28.7
Nonferrous Metal	May	4.5	4.6	24.8	27.3
Nonelectrical Machinery Equip. Industries, Total	May	15.4	15.3	77.9	70.2
Engines & Turbines	May	1.3	1.2	6.6	5.7
Farm Machinery & Equip.	May	1.1	1.2	6.3	5.7
Construction, Mining & Materials Handling Equip.	May	2.8	2.7	14.0	13.9
Metalworking Machinery	May	.9	1.0	4.8	4.4
General Industrial Machinery	May	1.4	1.3	6.3	6.0
Transportation Equipment Industry, Total	May	17.8	17.5	85.2	75.4
Motor Vehicle & Parts	May	10.8	10.7	52.2	45.5
Aircraft, Missiles & Parts	May	4.9	4.9	23.6	20.1
Shipbuilding & Military Tank Vehicles	May	.9	.8	4.2	4.1
Fluid Power Eqpt. (Index 1972 = 100)	May	219.6	216.4	—	—
Machine Tools**					
Net new orders	May	$ .2	$ .3	$ 1.4	$ 2.3
Shipments	May	.4	.4	2.1	1.9

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).
**Cutting and forming, domestic and foreign.

Sources: U.S. Dept. of Commerce, individual Motor Vehicle Mfgrs., National Fluid Power Assn., NMTBA.

box construction, and we'll probably make it from HSLA. So if you're hit in the side, the frame is there to stop anything.

"We're also going to extend the front-end well ahead of the front axle which will give us more crush space for front-end protection. We're using heavy duty brakes and larger wheels to take the extra load."

Checker is going to build a six-passenger 109 in. (2769 mm) wheelbase model, an eight-passenger 123 in. (3124 mm) wheelbase model, and a nine-passenger 128 in. (3251 mm) wheelbase model. It is also considering a Paratransit vehicle with a raised roof and wheelchair capabilities, which the Urban Mass Transit Administration has expressed an interest in.

With its new look, Checker is also hoping the car may have more potential in the public's eye. To this end they will provide more chrome and trim than is available on the taxi model, as well as a fancier interior.

Checker's president, David Markin, also has a new name for the car that may be sold to the public. But that is top secret. ■

Ford Gets Back On Track

by Nan S. Barbour

Ford has chalked up its first victory since its return to the racing circuit (see May '81, Talking Performance, "Ford's Back To Racing" p. 25). On June 14, Germany's Klaus Ludwig drove Ford's Miller Mustang to first place in the 42-lap Camel GT at Brainerd, MN. Ford's Mustang came in 53.4 seconds ahead of the Sachs Porsche driven by John Fitzpatrick.

The Miller Mustang race car is 202.4 in. (5141 mm) long with a 100.4-in. (2550-mm) wheelbase. It sports an aluminum chassis, Kelvar body panels, and front and rear spoiler. The car weighs 1808 lb (820 kg). Its 1.7-L (104-in.^{3}) engine puts out 560 hp @ 9000 rpm.

In other Ford racing activity, a Mercury LN7 came in third at an SCCA-sponsored race. On June 20-21, at the Nelson Ledges 24-hour race in Garretsville, OH, Ford vehicles finished third and sixth out of 34 cars.

The editorial staff of *Road & Track*

(Continued)

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by Joseph M. Callahan

Although Mexico's automobile and truck market is only about one twenty-fifth as large as the US's, it's the fastest growing market in the world. And Mexico's vehicle production capacity is expanding even faster than its market.

Spurred on by soaring oil reserves and a gross national product that has been rising 7 or 8% a year, Mexican car and truck sales rose 25% in 1978 and 18% in 1979. Last year the increase slowed to 8%, due largely to a long General Motors strike. In the first four months of this year auto retail sales were up 6.9%.

So far Mexico has avoided the automotive recession that's plaguing other industrial countries. Consequently, there's considerable confidence that by the late 1980s a million cars and trucks will be sold in Mexico annually.

National Wealth

According to Michael Hammes, general manager of Ford de Mexico, "Three important factors can be credited for this extremely healthy situation. Number one is the national wealth. Fortunately for Mexico, this wealth is primarily oil—tremendous reserves of oil. Besides supporting the vehicle industry and most other industries, the oil also has enabled Mexico to avoid the energy problems that many other countries have.

"Secondly, Mexico has a stable, pragmatic and logical government. This is my opinion and the opinion of many US experts. The government sets a policy and then plans on living with it for the next ten years.

"Thirdly, Mexico has a strong infrastructure of well-motivated, well-educated people. It still doesn't have enough of these people, but there a lot of very capable people in the government, industry, commerce and the unions."

Seven mostly foreign-owned auto companies and a half dozen largely government-owned truck and bus companies make up the Mexican vehicle industry. Last year these companies had factory sales of 464,411 vehicles. This included 286,041 cars; 170,331 light and medium trucks; 6671 truck tractors and 1368 buses.

Volkswagen was the leader in auto sales, shipping 94,927 units. Next came Chrysler de Mexico (56,850), Vehiculos Automotores Mexicanos or VAM (20,900) and General Motors de Mexico (17,278). American Motors owns about 25% of VAM, and the government owns the rest.

Chrysler Tops in Trucks

Chrysler led in factory truck sales last year with a total of 48,922 units. It was trailed by Ford (47,756), GM (20,946), Diesel National (19,753), Volkswagen (13,550) and VAM (6385).

Most of the above companies produced only light and medium-duty trucks. Diesel National and several smaller government-owned firms produced almost all of the heavy trucks and buses.

The four US connected auto companies, which captured 54% of Mexico's total vehicle market last year, have been substantially expanding their plants.

Ford is especially bullish on Mexico. To its present complex of three assembly plants and three manufacturing plants, Ford is adding a new four-cylinder engine plant in Chihauhua and three new joint-venture manufacturing plants in the Monterrey area.

These new factories will produce aluminum castings, glass and plastic parts. Mexican supplier companies must be 60% owned by Mexicans, although foreigners can own 100% of the vehicle plants.

GM Expanding

General Motors is building two very modern plants at Ramas Arizpe, near Saltillo. Cars will be assembled in one factory and 2.8-L (171-in.^{3}) V-6s will be produced in the other. When the assembly plant is completed by year-end, car production will be moved to Ramas Arizpe from GM's Mexico City facility which will be converted to truck production. Production of Chevrolet Citations will begin at the new plant next year.

Chrysler Corp. has also started production at a new engine plant at Saltillo with a capacity of 270,000 four-cylinder 2.2-L (134-in.^{3}) engines. In addition, Chrysler is nearing completion of substantial expansions at its truck plant in Mexico City and at its car assembly facility in Toluca, 40 miles (64 km) away. Next year this plant will start producing front-wheel-drive K-cars.

VAM, partly owned by AMC, will soon begin building a new plant at Larima where a Renault-engineered car, currently code-named X-42, will be assembled. Volkswagen also has a building program under way.

Auto Decree Set

A great factor behind this construction is Mexico's "Automotive Decree of 1977." In simple terms, it says that an auto or truck manufacturer must export $1 worth of products for every $1 worth of parts it imports.

Since the relatively small car and truck volumes in Mexico require the importation of large amounts of parts, the auto companies there are now preparing to ship 600,000 to 800,000 four- and six-cylinder engines and numerous other parts to the US annually.

This stream of castings and other parts has already started. The four US auto companies will be shipping parts into this country at an increasing rate, along with Volkswagen and Nissan.

For several years Mexico has had a negative automotive balance of trade with the US rising to about $500 million a year recently. The government of President Jose Lopez Portillo is now pressing to reduce this negative trade balance or at least prevent it from soaring into billions of dollars as Mexican car and truck production continues increasing.

The government also requires 50% local content by value in all Mexican cars, and 65% in all trucks.

Lower Mexican Wages

Although they have no choice, the auto companies are willingly going along with the Mexican Automotive Decree. A plus for them is that they'll be shipping car and truck components produced for about $5.50 an hour, the average Mexican auto labor rate, in contrast to the $18-$19 hourly rates in the US. However, the savings aren't as great as this because of the generally less efficient and low volume manufacturing in Mexico.

Despite the apparent justification for this move by Mexico, jobs will be lost and other inevitable dis-

locations will occur in the US. Some engine plants have already been shut down, and strong protest has been voiced.

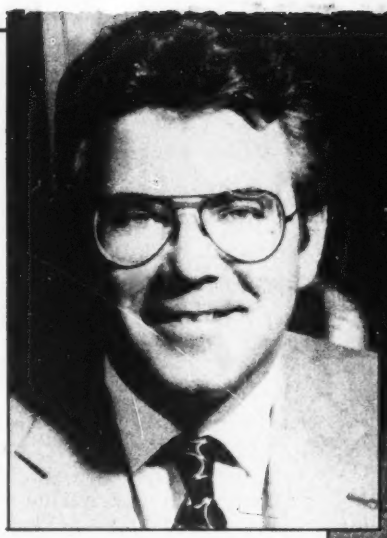
Describing the new Mexican import-export regulations, Ford's Hammes said, "There will be disruptions within both Mexico and the US because of where the employment comes from. But there's still a balance."

Hammes also predicted that in the future Mexico will continue to run a substantial negative automotive trade balance in favor of the US.

A serious social and economic problem for Mexico, according to Hammes, is the 40% *under*-employment problem there today (people trained and educated for a higher position but working at a lower one).

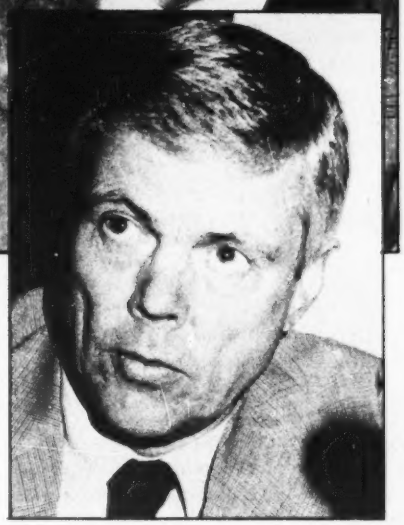
Jack Parkinson, managing director of Chrysler de Mexico for the past 11 years, commented, "I see it [the Automotive Decree] as an opportunity for both countries to grow as far as their automotive industries are concerned. The US will be supplying a lot more sheet metal and other related components than it has in the past to us in Mexico.

"And we in turn will be supplying engines [to the US]. I think there's a great opportunity to develop trade between the two countries to the benefit of North America. It's a tremendous opportunity for the US to export a lot more to Mexico than it has in the past."



Michael Hammes, general manager of Ford de Mexico

William Slocum, managing director of General Motors de Mexico



Jack Parkinson, managing director of Chrysler de Mexico

US Car and Truck Makers in Mexico

Company	Chrysler	Ford	General Motors	VAM (AMC)
1980 Vehicle Sales	105,772	38,289	38,224	27,285
1980 Car Sales	56,850	35,533	17,278	20,900
1980 Truck Sales	48,922	47,756	38,224	27,285
Total Work Force	9000	10,000	8000	5400
Number of Dealers	139	140	124	100
Car Models Sold	Lebaron, Cordoba, Dart, Valiant	Fairmont, Mustang, LTD	Malibu, Caprice, Monte-	American, Gremlin, Lerma
Truck Models Sold	Light, Medium	Light, Medium	Carlo Light,	Jeeps
New Cars Coming	K-car	Escort	Medium	X-42
New Plants	Saltillo	Chihuahua & 3 Joint Ventures	Citation Ramas Arizpe	Larma
Coming US Exports	4-cyl. engines	4-cyl. engines	V-6 engines	manual trans. & leaf springs

source: Motor Vehicle Manufacturers Assn. and individual companies

More Balance Expected

William Slocum, managing director of General Motors de Mexico, was asked about the possible loss of US jobs because of the Decree. He replied, "There has been a strong automotive trade balance in favor of the US. And it's fair to say that if Mexico's planning and legislation works out as anticipated over the next few years, those numbers [exports and imports] will come much more closely into balance.

"But as far as I can see, the Mexican auto industry will continue as a sizeable source of automotive jobs in the US. Nothing in the law requires a total Mexican car."

Todd O. Clare, vice president of international operations for American Motors, said the new Mexican regulations would not result in a reduction of US jobs. He added that

The beach at Acapulco. Mexico has avoided an auto recession partly due to its national wealth.

if US companies didn't cooperate with the Mexican government on this matter, there would be no business from Mexico for them.

Although auto executives see basic automotive growth in Mexico of 10-12% annually, Hammes said three factors could restrict this growth. These are: the ability of the local vendor industry to increase its capacity at the required rate of growth; the ability of automakers in Mexico to generate the exports to cover the additional imports that will be needed; and the ability of the auto companies to increase their assembly capacity fast enough.

Because of the shortage of parts from Mexican suppliers, most automakers are already having problems building complete vehicles. GM especially has been plagued with this problem during the past six months. Up to 50% of some car and truck models are "incompletes" because of shortages.

GM's Slocum was planning to ask the government to permit "extraordinary imports" of some parts if it was proved that the local suppliers were unable to meet their promised quotas. Most auto executives say the Mexican government is quite flexible and cooperative once they see an honest effort being made.

Mexico's "hot" economy has produced some special problems. One of these is an inflation rate of about 30% in the past year. Automakers appear to get around this headache, partly by raising car prices. For example, a Ford LTD or Chrysler

VW will invest $600 million in its Mexican operations in the next 10 years.

LeBaron now retails for more than $22,000 in Mexico.

Some Labor Unrest

The Mexican auto industry also has experienced some labor unrest. In addition to the lengthy GM strike, a crippling strike occurred last year at Tremec, which supplies transmissions to most of the companies. Clark Equipment Co. is part owner of this firm.

Government regulation of the Mexican auto industry is increasing with pollution control, safety and even fuel economy standards down the road, despite the oil bonanza. Air pollution from vehicular, stationary and natural sources is a serious and very conspicuous problem, especially in Mexico City which is 7200 ft (2195 m) above sea level. High-altitude emissions controls for new cars are in the offing.

The government has talked informally to all the auto companies about future Corporate Average Fuel Economy standards, partly because any petroleum that could be saved by more fuel-efficient cars and trucks could be a source of additional foreign currency which is much needed by Mexico.

A key question for US auto companies in Mexico is how well the governments of Mexico and the US get along in the future. Hammes concluded, "This is a damn crucial relationship. I don't pretend to know the right answer. But I do know that we'd better communicate honestly and openly with each other or we'll find ourselves in an atmosphere of confrontation.

"Both countries need each other. We both have our unique advantages and disadvantages. I'm optimistic that we'll find an open, honest and fair relationship. But for this to happen, I frankly believe we need more communication as to what we're trying to do and why we're trying to do it." ■

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Chilton's
SEPTEMBER 1

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THE GREAT MATERIALS SHOOT-OUT

Also

AMC Casts Thinwall Blocks

Tomorrow At Ford

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AUTOMOTIVE INDUSTRIES

September, 1981/Volume 161, Number 9

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COVER

Who's the fastest draw in lightweight materials? *AI* covers the big showdown.

NEXT MONTH

Our October new car issue covers domestic and foreign carmakers' bids for the automotive dollar, plus a look at plant energy management.

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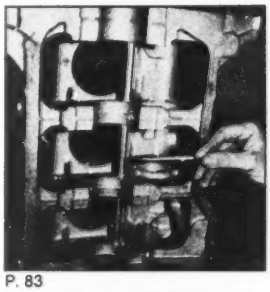
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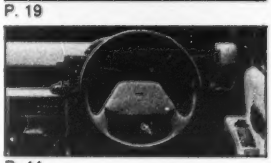
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Key indicators

U.S. New Car Production — Units — **Year to Date**

	July '81	July '80	1981	1980
AMC	10,396	8,129	56,391	81,622
Chrysler	58,506	50,497	492,918	378,483
Ford	109,031	114,758	871,201	803,633
GMC	304,135	347,669	2,525,473	2,548,991
VWoA	12,755	18,976	106,964	124,435
TOTAL	**494,825**	**540,029**	**4,052,947**	**3,937,164**
Imported Car Sales	192,064	217,059	1,463,104	1,468,964
Imported Car Penetration	29.5%	29.8%	26.5%	27.2%

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '81	Year to Date '80
New Orders	June	$ 88.5	$ 88.2	$531.8	$468.2
Shipments	June	88.5	86.7	523.3	464.0
Inventories	June	178.1	177.6	—	—
Unfilled Orders	June	315.0	315.0	—	—
Manufacturers Value of Shipments*					
Primary Metals, Total	June	$ 11.8	$ 11.8	$ 73.5	$ 70.3
Steel	June	6.2	6.2	37.7	32.4
Nonferrous Metal	June	4.5	4.5	28.7	30.9
Nonelectrical Machinery Equip. Industries, Total	June	17.0	16.8	103.1	90.9
Engines & Turbines	June	1.4	1.4	8.3	7.2
Farm Machinery & Equip.	June	1.3	1.2	8.1	7.2
Construction, Mining & Materials Handling Equip.	June	3.3	3.3	19.9	18.2
Metalworking Machinery	June	1.0	.9	6.0	5.6
General Industrial Machinery	June	1.3	1.5	8.5	8.0
Transportation Equipment Industry, Total	June	20.4	19.1	115.6	93.5
Motor Vehicle & Parts	June	13.4	12.3	74.3	55.7
Aircraft, Missiles & Parts	June	4.9	4.7	28.3	24.5
Shipbuilding & Military Tank Vehicles	June	1.2	1.1	6.8	6.3
Fluid Power Eqpt. (Index 1972 = 100)	June	220.6	219.6	—	—
Machine Tools**					
Net new orders	June	$ .3	$ .2	$ 1.7	$ 2.8
Shipments	June	.5	.4	2.7	2.3

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).
**Cutting and forming, domestic and foreign.

Sources: U.S. Dept. of Commerce, Individual Motor Vehicle Mfgrs. National Fluid Power Assn. NMTBA.

The price and uncertain availability of oil led Pillsbury to develop a synthetic oil that would easily meet the stringent requirements set down by the Resource Conservation and Recovery Act. The new Pillsbury 5000 Series can be used as a high water base hydraulic fluid, a gearbox lubricant, a slide and way lubricant, and a cooling/cutting lubricant.

"The compatibility of hydraulic fluids, lubricants and coolants is a great advantage to machine tool users," says Robert K. Rauth, Pillsbury's president. "As a machine lubricant, the concentrate is used undiluted.

"As a hydraulic and coolant fluid, it is reduced with water. If there is leakage of the hydraulic or lubricant fluid into the coolant, the problem of tramp oil contamination doesn't occur. In fact, lubricant leakage actually enriches the coolant.

"With the 5000 Series, there is no need to dump central coolant systems on a regular basis," adds Rauth. "Systems last for years, even with very hard water dilution. There is no need for water treatment systems."

The 5000 Series consists of the same basic solution which is modified for use with different materials such as cast iron, steel or aluminum. The fluids are organic chemical solutions and are fully biodegradable, non-toxic and non-hazardous.

Pillsbury claims they meet all current and pending EPA and OSHA standards and can be handled by standard waste disposal methods. It also claims that due to the 5000 Series' long life and recyclability, disposal systems can be eliminated.

At $4.30/gal. ($1.13/L), the price of the synthetic is considerably higher than oil, which prices at $1.71/gal. ($.45/L). But the 5000 Series can reportedly save the operator of a 10,000-gal. (37,854-L) transfer line cooling system over $3000 a year in operating costs. ■

Fwd Datsun 510 Debuts In Japan

by John R. Hartley

Nissan has changed the Datsun 510 from the ground up. For starters, the front-wheel-drive 510 has new 98- and 112-in.³ (1.6- and 1.8-L) four-cylinder engines mounted transversely with

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COVER

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NEXT MONTH

Designing for women, the latest in kit cars and custom coach builders, plus the battle for OEM sales between turbos and superchargers are all covered in Nov.

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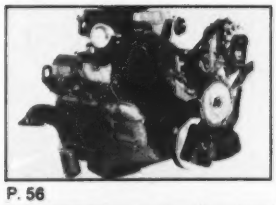
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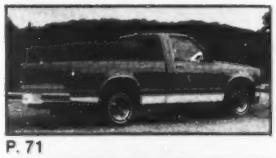
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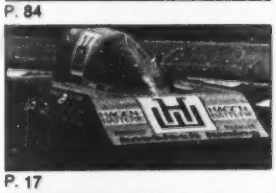
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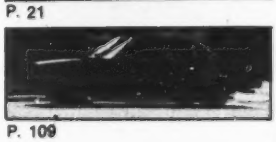
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Chevrolet Introduces 6.2-L Diesel

by Joseph M. Callahan

The "diesel era" at Chevrolet goes into high gear this year with the introduction of a new V-8 diesel for 1982 full-size pickups, Blazers, Suburbans and forward-control chassis.

This year Chevy will offer seven different diesel engines in more than 300,000 cars and trucks, making it the largest producer of diesel vehicles in the world, according to the company.

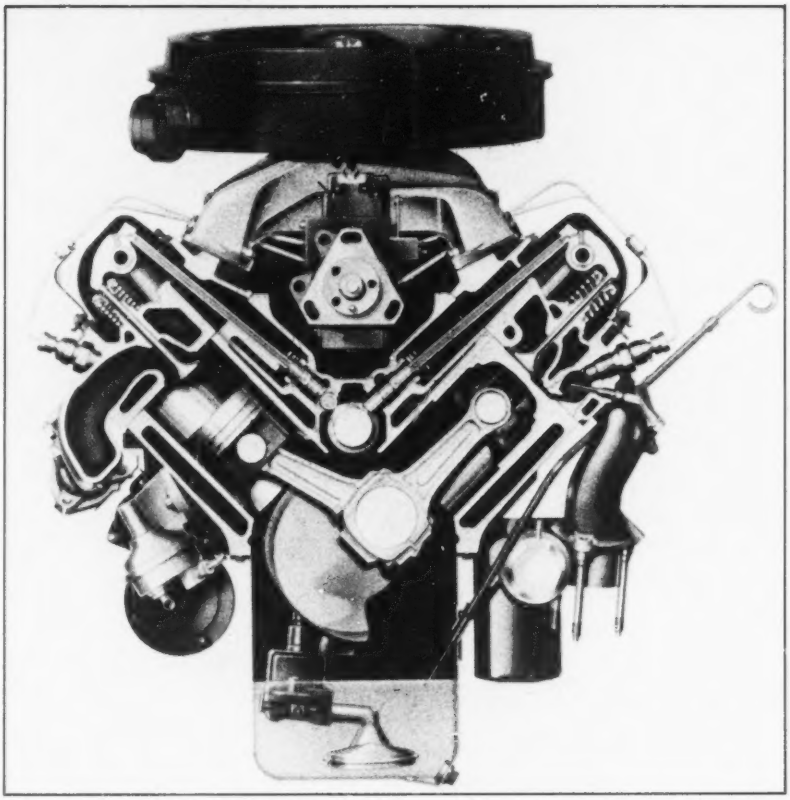
Unlike the Olds diesel engine and some others, this engine is not a converted gasoline unit. The new engine is based on technology provided by Ricardo Consulting Co. of England and employs a Ricardo Comet precombustion chamber. A Stanadyne mechanical fuel injection system with Bosch injector nozzles is used.

Chevrolet developed the engine and will manufacture it at the division's new Moraine, OH engine plant which was formerly occupied by the Frigidaire Div.

The engine is a 6.2-L (380-in.^{3}) V-8 that's expected to produce 130 hp @ 3600 rpm and 240 lb ft of torque @ 2000 rpm. Chevy expects it to deliver about 22 mpg in city driving and 27 mpg on the highway (10.7 and 8.7 L/100 km). This reportedly is 25% more than similar size gasoline engines provide in EPA tests.

Robert D. Lund, Chevrolet general manager, emphasized that this is a heavy-duty diesel. The timing will be set with microwave technology which will enable the engine to meet stringent California and federal emissions standards. Different versions of the engine are being built to meet the two emissions levels.

Other diesels marketed by Chevy are the Olds 5.7-L (350-in.^{3}) V-8, the new Olds 4.3-L (262-in.^{3}) V-6, the 1.8-L (110-in.^{3}) Isuzu four in the Chevette, the 2.2-L (134-in.^{3}) Isuzu four in the LUV pickup, plus the 8.2-L (500-in.^{3}) Detroit Diesel and the 3208 Caterpillar diesel in Chevy medium-duty trucks.



Chevy's new 6.2-L (380-in.^{3}) V-8 diesel is available in ½-ton, ¾-ton and one-ton pickups and Suburbans, in four-wheel-drive Blazers and in several commercial van and chassis models.

The compression ratio in the new Chevy is 21.5:1. The bore and stroke are 3.98 in. by 3.80 in. (101 x 97 mm). Other design features include forged steel connecting rods and camshaft, roller hydraulic valve lifters, dual strand chain camshaft drive, nodular iron crankshaft, four-bolt main bearing caps, nodular iron exhaust manifolds and cast iron cylinder heads secured by 17 bolts.

Oil and filter changes are required every 5000 miles (8045 km) in vehicles with GVWs lower than 8500 lb (3856 kg) and 3000 miles (4826 km) in larger vehicles. Fast action glowplugs and a block heater are standard.

The four-cycle engine has an in-tank water sensor and a primary fuel filter with water drain provisions. The engine weighs 683 lb (310 kg) with an automatic transmission and 743 lb (337 kg) with a manual transmission with its heavier flywheel. ■

Clarification

	Chrysler	Ford	General Motors	VAM (AMC)
1980 Vehicle Sales	105,772	83,289	38,224	27,285
1980 Car Sales	56,850	35,533	17,278	20,900
1980 Truck Sales	48,922	47,756	20,946	6,385
Total Work Force	9,000	10,000	8,000	5,500

Some of the figures in the chart accompany Joe Callahan's feature on Mexico (Aug. '81, "Working With Our Neighbors," p. 58) were incorrect. The revised chart is listed above.

Ford Examines Computer Transmission

Ford research engineers are burning the midnight oil on a device they predict may provide a 27% fuel savings.

The mechanism is an advanced com-

(Continued)

Key Indicators

U.S. New Car Production — Units

	Aug. '81	Aug. '80	Year to Date 1981	Year to Date 1980
AMC	4,921	16,936	79,523	114,084
Chrysler	40,916	31,430	547,086	388,368
Ford	110,450	68,008	948,256	804,223
GMC	236,795	179,080	2,798,318	2,695,903
VWoA	14,780	17,009	125,266	142,741
TOTAL	**407,862**	**312,463**	**4,498,449**	**4,145,319**
Imported Car Sales	198,878	198,873	1,682,773	1,683,538
Imported Car Penetration	—	—	27.6%	27.5%

Durable Goods Manufacturing*		Current Month	Previous Month	Year to Date '81	Year to Date '80
New Orders	July	$ 90.5	$ 88.3	$611.7	$538.9
Shipments	July	87.4	88.8	602.5	531.5
Inventories	July	180.7	178.7	—	—
Unfilled Orders	July	317.5	314.5	—	—
Manufacturers Value of Shipments*					
Primary Metals, Total	July	$ 12.0	$ 11.8	$ 84.3	$ 79.4
Steel	July	6.2	6.2	43.4	36.4
Nonferrous Metal	July	4.7	4.5	32.9	35.2
Nonelectrical Machinery Equip. Industries, Total	July	17.2	17.3	118.9	104.5
Engines & Turbines	July	1.5	1.4	9.6	8.2
Farm Machinery & Equip.	July	1.3	1.3	9.2	8.2
Construction, Mining & Materials Handling Equip.	July	3.3	3.3	23.2	20.9
Metalworking Machinery	July	.9	.9	6.9	6.4
General Industrial Machinery	July	1.5	1.4	9.9	9.2
Transportation Equipment Industry, Total	July	18.8	20.4	132.1	106.6
Motor Vehicle & Parts	July	12.0	13.4	84.5	62.9
Aircraft, Missiles & Parts	July	4.5	4.9	32.6	28.4
Shipbuilding & Military Tank Vehicles	July	1.3	1.2	7.9	7.3
Fluid Power Eqpt. (index 1972 = 100)	July	299.0	284.0	—	—
Machine Tools**					
Net new orders	July	$ .2	$ .3	$ 1.9	$ 3.1
Shipments	July	.4	.5	3.0	2.7

*Billions of dollars, seasonally adjusted monthly total (unless otherwise noted).
**Cutting and forming, domestic and foreign.

Sources: U.S. Dept. of Commerce, Individual Motor Vehicle Mfgrs. National Fluid Power Assn. NMTBA.

puter controlled automatic transmission that dispenses with a torque converter. Slated for use in the mid-'80s, the device uses a wet twin-plate clutch and five epicyclic ratios.

An analysis of energy requirements recorded over a wide span of driving conditions determines the optimum pattern for gear changing. An on-board computer is fed with a number of signals (including load, engine speed, and road speed).

The computer then selects the gear ratio and engine throttle opening. It can be programmed to provide either "sporting" or "economy" characteristics. At the moment the computer occupies a large area in the luggage space, but researchers hope to reduce it to a matchbox-sized module. ■

GM Europe Adds Paint Systems

by Peter J. Mullins

Over $40 million worth of sophisticated car finishing equipment has recently gone into production at two GM factories in Europe, the main Opel plant in Russelsheim, West Germany and the GM assembly complex at Antwerp in Belgium.

Haden Drysys Ltd (formerly called Carrier Engineering) supplied both car painting lines in what is believed to be the biggest single contract for a car finishing plant ever placed in Europe. The Russelsheim line handles 120 car bodies an hour and the Antwerp line 55. The new GM J-car, the replacement for the Ascona/Cavalier ranges, is being made at both places.

Haden Drysys' managing director, George Haynes, says he regards the order, particularly the Russelsheim part, as a coup for the British company in view of the strong competition from German-based paint plant makers.

"We put together an attractive package, including high quality paint booths, air washing, paint sludge recovery and drying," says Haynes. "In addition, our equipment was cheaper and offered economical running, ease of maintenance and compactness. Our package provided satisfactory answers to all the fashionable problems like health, safety and energy conservation."

GM was particularly attracted, apparently, by the unique Hydrospin booths.